VOLUME 1 OF 2.

REFERENCE ONLY

UNIVERSITY OF LONDON THESIS

Degree PhD Year 2006 Name of Author BAYLISS, A-C.

VALIDATING CLASSICAL MULTIVARIATE MODELS IN ARCHAEOLOGY

ENGLISH MEDIEVAL BELLFOUNDING AS A CASE STUDY

Alexandra Louise Bayliss
Institute of Archaeology, University College London,
31-4, Gordon Square, London, WC1H 0PY

Thesis submitted for PhD

VOLUME 1 (of 2)

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

ABSTRACT

The principal aim of this study is to apply various methods of numeric classification and ordination (commonly used by archaeologists) to the incidence matrix of stamps occurring on medieval bells from England, and to compare the results with what is known independently about these data from documentary sources. The incidence matrix records the presence of 1116 stamps on 3390 bells. Recorded bells have been assigned to 89 different founders, 51 of whom have bells appearing in the incidence matrix.

Three varieties of cluster analysis and correspondence analysis have been applied to this matrix. These analyses reveal clusters of bells and stamps relating to particular founders and foundries, and the relative chronological sequence in which the bells were cast and the stamps used. The success of each technique in defining these clusters and sequences accurately has been tested quantitatively by comparing the results of each analysis with the documentary record. For this to be valid, it is vital that the link between the documentary evidence and the surviving bells is rigorous and explicit. The criteria which have been used to link these two types of data are discussed in Chapter 2.

The results of the different mathematical approaches are given in Chapters 3 and 4. Only k-means cluster analysis provides results which are consistently in disagreement with the documentary evidence. The other techniques allocate between two-thirds and three quarters of bells or stamps accurately to clusters which relate to particular founders or foundries. Correspondence analysis has proven particularly successful at identifying clusters of bells which relate to foundries. The techniques have been less successful at identifying accurate chronological series of bells or stamps, with other sources of variation predominating.

Finally, some indication of the potential for such analyses to illuminate our understanding of the English medieval bellfounding industry is provided.

Frontispiece: the bellfounder's window, York Minster (Ellacombe 1872, plate XVIII)

CONTENTS

VOLUME 1

VOLUME 2

ACKNOWLEDGEMENTS

I would like to thank James Connolly, Peter Marshall, and Derek Hamilton, all of whom have provided valuable computer support during the course of this project. Paul Cattermole, George Dawson, and Chris Pickford have answered queries on specific bells which I myself have been unable to visit. Derek Keene and Mike Baxter also provided constructive criticism and suggestions in their capacity as examiners of the thesis. The staff of the Guildhall and British Libraries have been unfailing helpful. This study would never have been completed without the good sense and forebearance of Clive Orton. Thanks are due particularly to him and a number of other people who have lived with this study for far longer than any of us wanted.

ABBREVIATIONS

BL, Add MS	British Library Additional Manuscript
GL, MS 9171	Wills proved in the Consistory Court of London (Guildhall Library)
MRO	Maidstone Record Office
NCC	Wills proved in the Norwich Consistory Court (Norfolk Record Office)
NRO	Norfolk Record Office
PCC	Wills proved in the Prerogative Court of Canterbury (The National Archives, PRO, PROB11)
PRO	Public Record Office (now part of The National Archives)
Reg Dec & Capit	Wills proved in the Peculiar of the Dean and Chapter of York (York Minster)
Reg Test Ebor	Wills proved in the Exchequer and Prerogative Courts of York (Nottinghamshire Archives and The Borthwick Institute for Archives)
SRO/B	Suffolk Records Office (Bury St Edmunds)

LIST OF ILLUSTRATIONS

Figure 40: Single-link cluster analysis of units (partition at a similarity level of 0.7)

Figure 41: percentage error relating to documented founders of partitions at each level of similarity for the single-link cluster analysis of units (for the definition and methods of calculating estimates of Type A and Type B error see text)

Figure 42: combined Types A and B error relating to documented bellfounders for partitions at each level of similarity in the single-link cluster analysis of units (for the definition and methods of calculating this estimate see text)

Figure 43: Single-link cluster analysis of units (partition at a similarity level of 0.5)

Figure 44: percentage error relating to documented foundries of partitions at each level of similarity for the single-link cluster analysis of units (for the definition and methods of calculating estimates of Type A and Type B error see text)

Figure 45: Documented founders of bells contained in clusters 1 (mauve) and 3 (yellow) of the partition of the single-link cluster analysis of units at a similarity coefficient of 0.4 (see Fig 47)

Figure 46: combined Types A and B error relating to documented foundries for partitions at each level of similarity in the single-link cluster analysis of units (for the definition and methods of calculating this estimate see text)

Figure 47: Single-link cluster analysis of units (partition at a similarity level of 0.4)

Figure 48: Single-link cluster analysis of types (overall dendrogram)

Figure 49: number of clusters formed by partitions of the single-link cluster analysis of types at different levels of similarity

Figure 50: number of types allocated to clusters by partitions of the single-link cluster analysis of types at different levels of similarity

Figure 51: percentage error relating to documented founders of partitions at each level of similarity for the single-link cluster analysis of types (for the definition and methods of calculating estimates of Type A and Type B error see text)

Figure 52: combined Types A and B error relating to the trademarks of documented bellfounders for partitions at each level of similarity in the single-link cluster analysis of types (for the definition and methods of calculating this estimate see text)

Figure 53: Single-link cluster analysis of types (partition at a similarity level of 0.2)

Figure 54: percentage error relating to documented foundries of partitions at each level of similarity for the single-link cluster analysis of types (for the definition and methods of calculating estimates of Type A and Type B error see text)

Figure 55: Single-link cluster analysis of types (partition at a similarity level of 0.1)

Figure 56: combined Types A and B error relating to marks used by documented foundries for partitions at each level of similarity in the single-link cluster analysis of types (for the definition and methods of calculating this estimate see text)

Figure 57: location map of bells included in cluster 21 of the single-link cluster analysis of units from the partition at a similarity level of 0.4 (bells identical to those in the reduced incidence matrix, included from the complete incidence matrix)

Figure 58: single-link cluster analysis of units, cluster 9 of the partition at a similarity level of 0.4 (bells indentical to those in the reduced incidence matrix, included from the complete incidence matrix)

Figure 59: single-link cluster analysis of units, cluster 18 of the partition at a similarity level of 0.4 (bells indentical to those in the reduced incidence matrix, included from the complete incidence matrix). Those bells appearing in this cluster which also occur in cluster 75 of the partition at 0.6 are shown by solid red

spots (•), those also appearing in cluster 76 of the partition at 0.6 are shown by open black circles (○), and those unallocated by the partition at 0.6 are shown by open red circles (○)

Figure 60: Venn diagram showing stamps which occur on bells included in clusters 75 and 76 of the partition at a similarity level of 0.6 of the single-link cluster analysis of units, and stamps which appear on bells not contained in these clusters, but part of cluster 18 of the partition at a similarity level of 0.4 of the same analysis

Figure 61: similarities linking bells included in clusters 75 and 76 of the partition at a similarity level of 0.6 of the single-link cluster analysis of units, and bells which are not contained in these clusters, but are part of cluster 18 of the partition at a similarity level of 0.4 of the same analysis

Figure 62: similarities linking stamps included in cluster 69 of the partition at a similarity level of 0.2 of the single-link cluster analysis of types

Figure 63: partition at a similarity level of 0.3 of the stamps contained within cluster 69 of the partition at a similarity level of 0.2 of the single-link cluster analysis of types

Figure 64: within groups sum of squares (as a percentage of total sum of squares) for the k-means analysis of units for successive numbers of clusters

Figure 65: percentage error relating to documented founders of partitions forming increasing number of clusters for the k-means cluster analysis of units (for the definition and methods of calculating estimates of Types A and B error see text)

Figure 66: combined Types A and B error relating to documented bellfounders for partitions forming successive numbers of clusters in the k-means cluster analysis of units (for the definition and method of calculating this estimate see text)

Figure 67: percentage error relating to documented foundries of partitions forming increasing number of clusters for the k-means cluster analysis of units (for the definition and methods of calculating estimates of Types A and B error see text)

Figure 68: combined Types A and B error relating to documented bellfounders for partitions forming successive numbers of clusters in the k-means cluster analysis of units (for the definition and method of calculating this estimate see text)

Figure 69: within groups sum of squares (as a percentage of total sum of squares) for the k-means analysis of types for successive numbers of clusters

Figure 70: percentage error relating to documented founders for alternative solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of estimates of calculating Type A and Type B error see text)

Figure 71: overall error relating to the trademarks of documented bellfounders for solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of calculating this estimate see text)

Figure 72: percentage error relating to documented foundries for alternative solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of estimates of calculating Type A and Type B error see text)

Figure 73: overall error relating to the trademarks of documented foundries for solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of calculating this estimate see text)

Figure 74: number of bells included in the clusters of the solution of the k-means analysis of units which produces 50 clusters

Figure 75: distribution map of bells allocated to clusters by the k-means analysis which produces 14 clusters (black = clusters 1, 2, 3, 8, 11, and 13; cyan = cluster 4; green = clusters 5 and 10; grey = cluster 6; pink = clusters 7 and 12; red = clusters 9 and 14)

Figure 124: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-10 and clusters 11a-b), showing the segregation of cluster 11c

Figure 125: two dimensional map of bells produced by correspondence analysis of cluster 11, after the removal of clusters 11a – 11c

Figure 126: two dimensional map of bells produced by correspondence analysis of cluster 11d

Figure 127: two dimensional map of bells produced by correspondence analysis of cluster 11e

Figure 128: two dimensional map of bells produced by correspondence analysis of cluster 11h

Figure 129: two dimensional map of bells produced by correspondence analysis of cluster 11i

Figure 130: map of bells on the second and third axes produced by correspondence analysis of cluster 11f, showing variation in cluster 11k

Figure 131: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-11), showing the segregation of clusters 12 and 13

Figure 132: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-13), showing the segregation of clusters 14-16

Figure 133: map of bells on the first two axes produced by the correspondence analysis of cluster 14, showing the segregation of clusters 14a and 14b

Figure 134: map of bells on the first two axes produced by the correspondence analysis of cluster 14 (once clusters 14a and 14b have been removed), showing the division of clusters 14c and 14d

Figure 135: map of bells on the first two axes produced by the correspondence analysis of cluster 14d

Figure 136: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-16), showing the segregation of cluster 17

Figure 137: map of bells on the first two axes produced by the correspondence analysis of cluster 17

Figure 138: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-17), showing the segregation of cluster 18

Figure 139: map of bells on the first two axes produced by the correspondence analysis of cluster 18, showing the partition of clusters 18a-c

Figure 140: location map of bells in clusters 18a (black), 18b (red), and 18c (green) (bells identical to those in the reduced incidence matrix have been included from the complete incidence matrix)

Figure 141: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-18), showing the segregation of cluster 19

Figure 142: map of bells on the first two axes produced by the correspondence analysis of cluster 19 (once cluster 19a has been removed), showing the partition of clusters 19b-19e

Figure 143: map of bells on the first two axes produced by the correspondence analysis of cluster 19e

Figure 144: map of bells against the first and third axes produced by the correspondence analysis of cluster 19e

Figure 145: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-19), showing the segregation of clusters 20 and 21

Figure 146: location map of bells in cluster 20 (bells identical to those in the reduced incidence matrix have been included from the complete incidence matrix)

Figure 147: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-21), showing the segregation of cluster 22

Figure 148: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-22), showing the segregation of clusters 23 and 24

Figure 149: map of bells on the first two axes produced by the correspondence analysis of cluster 23

Figure 150: map of bells on the first two axes produced by the correspondence analysis of cluster 24

Figure 151: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-24), showing the segregation of clusters 25 and 26

Figure 152: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-26), showing the segregation of clusters 27 and 28

Figure 153: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-28), showing the segregation of clusters 29, 30, and 31

Figure 154: map of bells on the first two axes produced by the correspondence analysis of cluster 29

Figure 155: map of bells on the first two axes produced by the correspondence analysis of cluster 30, showing the separation of clusters 30a and 30b

Figure 156: map of bells on the first two axes produced by the correspondence analysis of cluster 30b

Figure 157: map of bells on the first two axes produced by the correspondence analysis of cluster 31, showing the separation of clusters 31a and 31b

Figure 158: map of bells on the first two axes produced by the correspondence analysis of cluster 31b

Figure 159: summary of clusters of stamps formed by 'peeling' of the data during successive correspondence analyses; groups which are not further divided have single nodes, analyses showing the 'horseshoe' effect are circled

Figure 160: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-3 have been removed), showing the separation of clusters 4 – 7

Figure 161: map of stamps on the first two axes produced by the correspondence analysis of cluster 4, showing the segregation of clusters 4a – 4c

Figure 162: map of stamps on the first two axes produced by the correspondence analysis of cluster 4c

Figure 163: map of stamps on the first two axes produced by the correspondence analysis of cluster 5, showing the segregation of clusters 5a and 5b

Figure 164: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-7 have been removed), showing the separation of clusters 8 and 9

Figure 165: map of stamps on the first two axes produced by the correspondence analysis of cluster 8, showing the segregation of clusters 8a – 8c

Figure 166: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-9 have been removed), showing the separation of clusters 10 and 11

Figure 167: map of stamps on the first two axes produced by the correspondence analysis of cluster 11, showing the segregation of clusters 11a – 11c

Figure 168: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-11 have been removed), showing the separation of cluster 12

Figure 169: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-12 have been removed), showing the separation of clusters 13 – 15

Figure 170: map of stamps on the first two axes produced by the correspondence analysis of cluster 13, showing the segregation of clusters 13a – 13b

Figure 171: map of stamps on the first two axes produced by the correspondence analysis of cluster 14, showing the segregation of clusters 14a – 14c

Figure 172: map of stamps on the first two axes produced by the correspondence analysis of cluster 15, showing the segregation of clusters 15a – 15c

Figure 173: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-15 have been removed), showing the separation of clusters 16 and 17

Figure 174: map of stamps on the first two axes produced by the correspondence analysis of cluster 16, showing the segregation of cluster 16a

Figure 175: map of stamps on the first two axes produced by the correspondence analysis of cluster 16 (once cluster 16a has been removed), showing the separation of cluster 16b – 16d

Figure 176: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-17 have been removed), showing the separation of cluster 18

Figure 177: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-18 have been removed), showing the separation of clusters 19 and 20

Figure 178: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-20 have been removed), showing the separation of clusters 21 and 22

Figure 179: map of stamps on the first two axes produced by the correspondence analysis of cluster 22, showing the segregation of clusters 22a – 22c

Figure 180: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-22 have been removed), showing the separation of clusters 23 – 25

Figure 181: map of stamps on the first two axes produced by the correspondence analysis of cluster 23, showing the segregation of clusters 23a – 23d

Figure 182: map of stamps on the first two axes produced by the correspondence analysis of cluster 24, showing the segregation of clusters 24a and 24b

Figure 183: map of stamps on the first two axes produced by the correspondence analysis of cluster 25, showing the segregation of clusters 25a – 25c

Figure 184: map of stamps on the first two axes of the correspondence analysis of cluster 25c

Figure 185: location map of bells included in cluster 17 of the partition of units by correspondence analysis forming 35 clusters

Figure 186: map of bells on the first two axes of the correspondence analysis of cluster 10b

Figure 187: proposed sequence for the Wokingham/Reading foundry, based on the correspondence analysis by units of cluster 10 and documentary evidence

Figure 188: map of stamps on the first two axes of the correspondence analysis of cluster 15b

Figure 189: proposed sequence for the London foundries, based on the correspondence analysis by units of cluster 11 and documentary evidence

Figure 190: location map of bells included in clusters 19b (red), 19d (green), and 19e (black, hollow) of the partition of units by correspondence analysis forming 35 clusters

Figure 191: 'seriation' of cluster 2 formed by the correspondence analysis of units (Figs 87 and 91)

Figure 220: map showing bells cast by founders probably based in Worcester in the medieval period (□ cluster B; ■ cluster 2; ■ cluster 23; ■ cluster 31a)

Figure 221: map showing bells cast by founders probably based in Leicester in the medieval period (■ cluster 8; □ cluster 9a; □ cluster 12; □ cluster 21a)

Figure 222: map showing bells cast by founders probably based in Nottingham in the medieval period (■ cluster 1; □ cluster 7d; ■ cluster 7e; ■ cluster 24b; □ cluster 27; □ cluster 30b)

Figure 223: map showing bells cast by founders based in Chesterfield in the medieval period (■ cluster 9d)

Figure 224: map showing bells cast by founders based in York or surrounding districts in the medieval period (■ cluster A; □ cluster B; □ cluster 6a; ■ cluster 7c; □ cluster 7b; ■ cluster 9c)

Figure 225: map showing bells in cluster 29 (■), including bells by founders based in King's Lynn and Toddington, Bedfordshire in the medieval period

Figure 226: map showing bells cast by founders based in Lincolnshire in the medieval period (■ cluster C; ■ cluster 7a; □ cluster 24a; ■ cluster 30a)

Figure 227: map showing bells cast by founders based in the Midlands in the medieval period (■ cluster D; □ cluster 15; ■ cluster 20; □ cluster 25; ■ cluster 26; □ cluster 28)

Figure 228: map showing bells cast by John Tonne and Thomas Harrys of London (■ cluster 3; ■ cluster 22)

Figure 229: map showing the distribution of bells allocated to a place of manufacture by the correspondence analysis of units and the documentary evidence (x local and itinerant founders; • Bristol; ■ Bury St Edmunds; ■ Chesterfield; • Exeter; ■ Gloucester; ■ Leicester; □ London; □ Norwich; ■ Nottingham; ■ Reading/Wokingham; o Salisbury; □ Worcester; □ York)

LIST OF TABLES

Table 20: percentage Type A error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 21: percentage Type A error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 22: percentage Type B error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 23: percentage Type B error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 24: percentage overall error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 25: number of clusters formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (levels) (\ = more than 99 clusters; entries in bold are those for partitions considered in detail in subsequent analysis)

Table 26: number of bells in residue formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters; entries in bold are those for partitions considered in detail in subsequent analysis)

Table 27: percentage overall error relating to documented founders of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 28: estimated errors relating to documented founders of partitions forming the maximum number of clusters for selected numbers of shared near neighbours (k) in the shared near neighbour cluster analysis of types

Table 29: percentage Type A error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 30: percentage Type A error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 31: percentage Type B error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 32: percentage Type B error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 33: percentage overall error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 34: percentage overall error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

Table 35: estimated overall error for the selected partitions relating to founders and foundries of the shared near neighbour cluster analysis of units and types

CHAPTER 1

INTRODUCTION

Classification and chronology are fundamental to archaeological study. They are the tools which enable us to compare the material residues of past societies, and to disentangle the variations in that record which depend upon time from those determined by the cultural choices of people, or the practicalities of the space in which they lived. Consequently these techniques are the foundations upon which interpretative archaeology is built—if they are founded on sand, then the rest is sophistry.

Given their critical place in the understanding of past societies from material culture, it is perhaps unfortunate that both disciplines have been regarded as unfashionable branches of archaeological research for a number of years, at least in the English-speaking world.[1] In truth this has been more apparent than real, and in fact much research effort continues to be allocated to these problems (Hines *et al* 1999; Müller and Zimmermann 1997; Jørgensen 1992; Madsen 1988).

This study is an attempt to explore, quantitatively, the strengths and weaknesses of some of the numerical approaches to classification and chronology which are in common use in archaeology. Deliberately the techniques chosen are all easily available in a variety of 'off-the-shelf' computer packages, and archaeological applications of the methods are easy to locate.

This approach is possible because of the well-documented nature of the archaeological data set chosen for examination, as the results of the mathematical analyses presented in Chapters 3 and 4 can be compared, not only with each other, but with the independent evidence of grouping and dating discussed in Chapter 2. This use of additional information, external to the mathematical analysis, may be regarded as a means of taking a processual approach to contextual archaeology. Because the additional information is external to the analyses, it can be used to test how far clusters of units and types defined

[1] The number of articles relating to archaeological classification which use clustering techniques apparently declined in the late 1970s following articles by Thomas (1978) and Christenson and Read (1977) (Aldenderfer 1987, 20). As neither of these papers high-light any fundamental methodological problems with cluster analysis, but rather cover the misuse of statistical techniques in general and the appropriateness of particular techniques to a particular problem (Aldenderfer and Blashfield 1978; *pace* Read and Christenson 1978), the decline perhaps relates more to changes in theoretical thinking than to unsolvable methodological concerns (*pace* Aldenderfer and Blashfield 1984). This perceived decline certainly did not extend on to Continental Europe or into archaeometry.

by an analysis actually relate to groups defined by documentary evidence. How far does the relative chronology produced by correspondence analysis agree with the absolute chronology known from other evidence? In contrast to the majority of applications where "external criteria are often subject to disagreement, and in many cases may be nothing more than matters of opinion" (Aldenderfer 1987, 61), the external information in this application is cast in bronze (see Chapter 2).

Once the differences between the results of the analyses have been quantified, the next step is to explore the reasons for these differences. Firstly, there are the assumptions which underlie the statistical models. These are well known and explicit (to mathematicians if not to all archaeological users!). In what ways does the behaviour of the data conflict with the assumptions of a model? Can these conflicts be seen in the diagnostic statistics produced by the techniques? Secondly, are there certain types of human behaviour which seem to conflict with the assumptions of particular models? For example, does a seriation cease to produce an accurate relative chronology when patrilineal succession fails? It is hoped that the answers to some of these questions produced by this study may inform other users of the techniques, in the interpretation of results produced by these models when they are applied to data sets where information external to the analysis is minimal if not entirely lacking.

Although the focus of this study is on methodology, the production and analysis of such a large data set inevitably sheds new light on the subject of the data, here English medieval bellfounding. On a simple descriptive level, Figure 1 is the first ever distribution map of all known medieval bells, Appendix 1 contains the first complete catalogue of medieval bell marks, and Appendix 2, the first comprehensive list of all known medieval bells from England. The database produced as part of this project contains all published information on each medieval bell included in the study and computerises the medieval portion of the Council for the Care of Places of Worship's schedule of bells for preservation. The deposition of the database with that body will therefore also contribute to wider aims for the management and conservation of surviving medieval bells.

Some of the classifications and chronologies produced are also pioneering. There is, for example, very little published work on the lines of descent of any of the northern foundries (Benson 1904; Jewitt 1873e) and the foundries at Exeter and Salisbury are also poorly understood (Colchester 1920; Sharpe 1976). Our knowledge of other foundries is

largely based on studies undertaken at the turn of the twentieth century (Tilley and Walters 1910; Walters 1906a; 1911; 1918; Cocks 1897; Stahlschmidt 1884; Tyssen 1915), and only foundries in London and East Anglia have received detailed attention over the last few decades (Clouston and Pipe 1980; Cattermole 1985; 1990; Bayliss 1987; Bayliss and Orton 1988).

The vintage of much of the literature on medieval bellfounding is reflected in the review of documentary evidence discussed in Chapter 2. The original intention was simply to analyse critically the relationships between the known documentary references and the physical bells, but it soon became apparent that there is a plethora of additional historical material which is as yet unknown to campanists. Consequently much of Chapter 2 is also innovative, although there is undoubtedly much more research to be done in this vein, even only using printed sources.

The work presented here is, however, the foundation for investigating the medieval bellfounding industry. The classifications and chronologies produced as part of this study are a fundamental prerequisite for using this dataset to explore wider agendas about medieval religion, production, and trade. For bells, as well as for archaeology, it is essential firstly to demonstrate that the foundations are reliable.

1.1 Classical multivariate models in archaeology

Classical statistical inference is statistical inference which is not based on the Bayesian paradigm. Until very recently almost all applications of quantitative methods in archaeology were classical. This is not because the potential of the Bayesian approach was not appreciated (Orton 1980, 122; Ruggles 1986), but because the methodology needed for practical applications has only recently been developed (Gelfand and Smith 1990). Although the Bayesian approach has been introduced specifically to archaeology (Buck *et al* 1996), applications relating to classification and seriation are rare (Buck and Litton 1991; Buck 1993; Dellaportas 1998; Buck and Sahu 2000; Halekoh and Vach 2004). It is only in the contextual analysis of radiocarbon dates and associated archaeological information that applications can in any way be described as routine, principally because of the availability of software to carry out the analyses (Bronk

Ramsey 1995; Buck *et al* 1999) and the involvement of highly numerate physicists in radiocarbon dating (eg Steier and Rom 2000; Goslar and Madry 1998).

Multivariate methods are those which examine multiple variables. They include familiar techniques such as cluster analysis, seriation, discriminant analysis, principal component analysis, correspondence analysis, multidimensional scaling, and various types of regression. Of these techniques, a sub-set have been applied in this study.

Whether all of these techniques are formal, mathematical, "models" is a moot point. Whereas all the techniques do make assumptions about the structure of the data analysed, they do not impose a particular model of how the data works. In this sense they can be described as "exploratory" (Baxter 1994, 1). Perhaps they are best regarded as generalised models, rather than applications which attempt to formally model the specific parameters of a particular problem. All the methods discussed are, however, models in the sense that they attempt to produced a simplified view of the data which is archaeologically meaningful (Voorrips 1987, 68).

All the techniques considered are also both readily available in a variety of software packages and commonly used in archaeology. The use of seriation has the longest history in the discipline, from its invention at the turn of the last century (Petrie 1899). Cluster analysis came next, enabled by the growing computer power and software required to implement the necessary algorithms. Although probably at the height of its popularity in the 1970s, these methods have enduring appeal, exemplified by the fact that 74% of papers concerning the analysis of the chemical compositions of artefacts considered by Baxter (1994, 13) use the technique. Correspondence analysis is the new-comer on the block, with relatively few English-language applications even by the early 1990s (Baxter 1994, 133-9; Orton 1992). Undoubtedly it has become increasingly used during the past decade, but even during that period papers using the technique were out-numbered both by those using cluster analysis and by those using other methods of seriation (Fig 2).

1.1.1 Numeric classification

Since the pioneering work of the early 1960s (Sokal and Sneath 1963), there has been an explosion of interest in formal statistical models of classification. This interest is not centred on archaeology, but encompasses a wide range of disciplines from electrical

engineering to psychiatry, with computers enabling widespread application of techniques which are being, largely, developed by mathematicians. From the late 1960s the inter-disciplinary nature of the subject led to the foundation of a number of National Classification Societies, the *Journal of Classification* (in 1984), and the International Federation of Classification Societies (in 1985) which has sponsored a series of conferences (Bock 1988; Diday *et al* 1994).

An indication of the general trends in classification research can be gained from the papers published in the *Journal of Classification* since its foundation (1984-2000; n=219). Hierarchical clustering techniques are still the most common subjects of research, being relevant to at least 25% of papers. In terms of techniques, multidimensional scaling (13%) and non-hierarchical clustering techniques (10%) are the next most popular, although perhaps the most striking feature is the heterogeneity of approaches discussed (Fig 3). Many papers, however, focus on specific aspects of classification, the most popular subjects being the definition, optimisation, and partitioning of trees (21%), the discussion of (dis)similarity measures (13%), and metrics (6%). Although Monte Carlo methods appear reasonably frequently (n=13), the paucity of specifically Bayesian approaches is surprising (n=4). The comparative rarity of papers concerning correspondence analysis (n=3) and seriation (unidimensional scaling)(n=8) is perhaps less surprising, given the specifically archaeological interest of those methods for determining chronology, although correspondence analysis at least has a wide range of applications in other disciplines.

In archaeology cluster analysis is still king, being used in well over half the papers considered by Baxter (1994, 12-24). In a review in 1973 Aldenderfer and Blashfield (1984, 35) found that two thirds of applications using cluster analysis used hierarchical agglomerative techniques, and these are still the most frequently applied. The other most commonly used approach is k-means clustering, with other types of clustering algorithm applied only infrequently (see §3.2 below). Correspondence analysis has also been applied, although this is more usually applied in search of ordination than grouping. Two other methods, principal components analysis and multidimensional scaling, are also commonly applied although, as they are generally more suitable for continuous data rather than categorical data (see §1.3.3 below), they will not be discussed in detail here.

Although it is the tried (if not trusted!) techniques which form the vast majority of applications in the archaeological literature, more recently a number of alternative approaches have been attempted. These do not encompass the entire range of those found in the classification literature, although Bayesian applications figure well (Buck and Litton 1991; Buck 1993; Dellaportas 1998), and there are examples of the use of fuzzy set theory (Barceló 1996), latent class models, (García Sanjuán and Rodríguez López 1996), bi-plots (Baxter 1992), and graphical modeling (Scott *et al* 1991).

1.1.2 Seriation, ordination, and absolute chronology

If chronology is fundamental to archaeological study, then seriation is the grandmother of its invention. Absolute dating techniques are a discovery of the last half century, and schemes of relative chronology have been devised by archaeologists since Thomsen's Three-Age System (Daniel 1975, 38-54), or Flinders Petrie's more formal approaches (Petrie 1899; Kendall 1963).

Seriation is a problem rather than a technique, and can be tackled using a number of quantitative methods. It is the process of ordering archaeological entities on the basis of co-occurrences within particular horizons. So, for example, artefacts can be placed into relative chronological order on the basis of their co-occurrence with other artefacts in sealed assemblages, such as hoards and graves. Methods of seriation are the most "congruent" of statistical techniques in archaeology (*sensu* Whallon 1984), as their development has been based in the discipline from its foundation. There is, however, some wider interest in the problem of ordering, and the technique is elsewhere known as ordination or unidimensional scaling.

Petrie's initial statement of the problem was formal but not mathematical. Seriation was formalised explicitly by Brainerd (1951) and Robinson (1951), whose basic model was refined and developed over the succeeding decades (Kendall 1970; 1971; Wilkinson 1974; Graham *et al* 1976; Laxton 1976; 1987; Ihm 1981; Laxton and Restorick 1989). During the 1980s correspondence analysis was adopted as an alternative, more graphical, approach to ordination (Djindjian 1989; Bolviken *et al* 1982; Greenacre 1984), although it has by no means ousted the older model (see above Fig 2). More recently a variety of approaches have been attempted, although none as yet has passed into widespread usage (Scott 1993; Barceló and Faura 1999; Buck and Sahu 2000; Halekoh and Vach 2004).

The past fifty years has also seen an explosion in the availability of absolute dating information for archaeology following the discovery and development of scientific dating techniques (Douglas 1935; Huber 1941; Libby *et al* 1949; Aitken *et al* 1964; Huntley *et al* 1985), to join traditional reliance on coins, inscriptions, and documentary evidence. Over this period these techniques have increased in number, applicability, accuracy, and precision (eg Taylor and Aitken 1997; Kuniholm *et al* 1996; Kitagawa and van der Plicht 1998; Batt 1997; Murray and Wintle 2000).

Archaeologists have always attempted to interpret the results of absolute and relative dating techniques together to come to an understanding of the chronology of their sites or problems. In the past decade, however, the first attempts have been made to integrate such information within an explicit mathematical framework. The vanguard has been taken by the need to integrate radiocarbon dates with other evidence, principally the relative dating provided by stratigraphy (Buck *et al* 1991; Zeidler *et al* 1998; Bayliss *et al* 1997), floating tree-ring sequences (Christen and Litton 1995; Goslar and Madry 1998), peat deposits (Kilian *et al* 1995; Christen *et al* 1995), and historical records (Lu *et al* 2001). These applications have principally, but not exclusively, taken a Bayesian approach. During the same period, there has been some consideration of grafting absolute chronology on the results of seriation models (Hertzog and Siegmund 1991), although the difficulties encountered are appreciable (Steuer 1990).

1.2 Medieval bells

Medieval bell-founding was a mainstay of antiquarian study during the nineteenth century, with close links to the high-church clerical revival and the renaissance of change-ringing. This led to the production of a series of monographs and articles during the second half of the century, cataloguing the existing bells of various counties and discussing their histories. This wave of research was initiated by the publication of a selection of bells from Wiltshire (Lukis 1855), and perhaps climaxed with the publication of two monographs on the bells of England (Raven 1906b; Walters 1912).

In the twentieth century the compilation of county histories continued, albeit at a much reduced pace, to the point where there is now at least a basic catalogue for all the counties

of England, barring parts of Yorkshire (Fig 4). Indeed a number of counties have had the benefit of a second history, some effectively cataloguing all bells in a county for the first time where the Victorian work was incomplete (eg Nottinghamshire: Dawson 1994; 1995a, b), some providing a briefer record of changes or corrections noted since the publication of the previous volume (eg Cornwall: Cannon 1979; Dunkin 1878), and some providing a completely new catalogue based on extensive new fieldwork (eg Gloucestershire: Bliss and Sharpe 1986).

Recently, research emphasis has shifted away from the bells themselves, and bell frames have received some attention (Elphick 1945; Brooke 1983; Cattermole and Cotton 1983; Pickford 1993). This is partially in response to the decreased threat of recasting for medieval bells (Fig 5), and the increased threat to historic bell-frames as change ringing, augmentation, and cast-iron installations have become the norm.

1.3 The data

Data are not given, they are chosen. I have selected data about recorded medieval bells in England for use in this study. Of all the potential attributes of medieval bells, campanists have elected to record a particular sub-set. I, in turn, have selected a sub-set of this recorded data for analysis here. The criteria which determined these choices are discussed in this section.

1.3.1 Why bells?

Typology is not classification. Units can be grouped on the basis of the attributes which occur on them, but attributes can also be grouped on the basis of co-occurrence on units. Classification is this process of grouping. Typology is the definition of the attributes used in the analysis and is a more basic level of interpretation. In this application, the difficulties of typology are largely bypassed because the attributes (types) have a physical reality. They comprise the marks on the bells which were cast in the mould on manufacture. The majority of these marks do not seem to have been specifically made for particular bells, but to have been wax impressions made from pottery or wooden moulds which formed part of the founders' tool kit. These marks are therefore types which have

an absolute physical reality independent of archaeological interpretation (see §1.3.2 below; Adams 1988).

Another advantage of medieval bells for a study of this nature is the existence of a large body of documentary evidence which can be related to the existing sample of bells. This information is set out in Chapter 2, and enables the independent validation of the results produced by the various mathematical analyses. It should be confessed, however, that similar data for post-medieval bells (many of which bear the name of the founder and date of casting) would be better suited for a purely methodological study. However, this analysis has the advantage that there is also the potential to understand more about the medieval bell-founding industry, particularly those foundries where little documentary evidence survives or has been uncovered. There is also far more recorded information about the stamps and lettering on medieval bells, as these were recognised as indicative of date and founder from the early days of the antiquarian study of bells.

Two further characteristics of medieval bells are potentially important. First, the surviving sample of 4797 bells comes from an (approximately) known population. Between 1549 and 1553 inventories of church goods were made so that commissioners could sell items regarded as 'superstitious' or unnecessary for the simplified form of worship set out in the Prayer Book of 1552 (Eeles 1905, ix). These Edwardian inventories survive for many counties and provide a 'snap-shot' of the number of bells in each tower at the Reformation, although fortunately few bells appear actually to have been sold at this time (Cresswell 1916, iv). So, for example, the 1553 inventory records a total of 1645 bells in the County of Devon, with 25 more in the City of Exeter (excluding the Cathedral whose entry is missing)(Ellacombe 1872, 84-9). In total, details of 265 medieval bells have been recorded from churches in Devon, representing a surviving sample of approximately 16% of the tower bells recorded at the Reformation. Totals for other counties vary, but are at least potentially calculable.[2] Second, bells are extremely difficult to move. They are heavy, fixed into high and awkward spaces, expensive, and breakable. Moving them is not a task to be undertaken without good reason. This is not to say that bells have never been transferred from tower to tower, just that this is difficult and comparatively rare. They are certainly amongst the least portable of antiquities.

[2] The 195 surviving entries for Lincolnshire record 533 tower bells and 152 sanctus bells (Ketteringham 2000, 1). This compares with 2034 bells recorded in 683 churches by Thomas North (1882). Increasing the Edwardian totals *pro rata* for the missing entries, it can be estimated that there were 1867 tower bells and

Consequently the recorded locations of the bells in the dataset are likely to be those of the same bells in the medieval period. There are, indeed, some instances where this can be demonstrated (eg Redenhall, Norfolk; see below §2.4.4).

1.3.2 Why stamps?

The use of the presence and absence of stamps on bells as the basic data matrix for this study has advantages and disadvantages, but in practice this has been predicated by the data recorded by previous workers and by the nature of the artefacts under consideration (Fig 6).

Inscriptions provide the most promising data for classifying medieval bells. Firstly there is some record of inscriptions on 4003 of the 4797 bells in this study (83%). The types of lettering used for these inscriptions are shown in Figure 7. This basic classification is too simple to define founders or foundries, although there is some evidence that lettering types are indicative of date (Fig 8). Using the external information detailed in Chapter 2, it seems that Roman capitals (whether or not combined with Gothic capitals) are indicative of thirteenth-century bells, the fourteenth century is dominated by bells cast using Lombardic capitals, which are gradually replaced during the first half of the fifteenth century by mixed Gothic inscriptions. After 1500 Lombardic capitals make a come-back and mixed Gothic inscriptions are joined by those entirely in minuscule.

Looking in more detail at the marks on bells, we discover that they were generally formed by placing wax impressions of the desired marks on the surface of the 'false bell' during loam or wax moulding. These wax impressions appear to have been formed in pottery or wooden moulds. This is shown by capitals 8.0116 and 8.0114, which are formed from the same mould, although the latter has a horizontal line across it where the matrix has become cracked.[3] The use of wax for these impressions is also demonstrated by evidence of attempts to cut or brush away the patterae of the marks on some bells (Elphick 1970, 16). Thus bell marks appear to relate directly to a piece of equipment which would have been physically present in a foundry. This has advantages for classification, for a founder could only use stamps to which he had access in his tool kit, either those inherited from a predecessor or which he himself created. On iconographic grounds it can also be shown

532 sanctus bells in Lincolnshire at the Reformation. Of these 331 tower bells (18%) and 12 sanctus bells (2%) are included in the dataset considered here.

[3] Incidently this also demonstrates that mark 8.0114 must be later than 8.0116.

that some stamps were 'maker's marks' for particular founders or foundries (see Chapter 2 below). Stamps which co-occur on a bell must therefore have been in use by the same founder, in the same place, at the same time; some can also be regarded as 'type fossils' for particular founders or foundries.

Bell marks are also frequently recorded. Appendix 1 contains a complete catalogue of the 1123 known medieval bell marks. At least one of these is recorded on 3390 of the 4003 inscribed bells considered in this study. Thus 85% of inscribed bells, and 71% of all bells, may potentially be classified using evidence of the stamps cast upon them.

Other characteristics of inscriptions are recorded as frequently as the stamps, but their incidence may be determined by factors other than the founder who cast the bells on which they appear.

The inscriptions on medieval bells are many and varied. Over 800 types have been recorded, although the majority fall into a number of easily identifiable categories. For example, 416 bells are inscribed with variants of the angelic salutation: Ave Maria Gracia Plena Dominus Tecum Benedicta Tua In Mulieribus. This occurs in more than 50 forms, with three accounting for well over half of its occurrences: Ave Maria Gracia Plena (85); Ave Maria (102); and Ave Maria Gracia Plena Dominus Tecum (80). In all, 3551 of 4003 inscribed bells (89%) can be accounted for by only 23 generic formulae of this type (Fig 9).

Turning to the 1069 bells which bear inscriptions in one of the generic formulae, but also have independent evidence of foundry (see Chapter 2 below), strong correlations between certain formulae and certain foundries are apparent. Most strikingly, all 9 such bells bearing Vox mea viva depello cuncta nociva are from the Exeter foundry, as are all 14 bells bearing Plebs ois plaudit ut me tam sepius audit, all 6 bells bearing Protege virgo pia quos conboco sancta maria, and all 18 bells bearing Est michi collatum istud nomen amatum. The distribution of all bells bearing these inscriptions (Fig 10) supports this evidence, but perhaps suggests that Protege virgo pia quos conboco sancta maria may also have been used outside Exeter.

Excluding those formulae which have a 100% correlation with a particular foundry according to the independent evidence (Table 1), a correspondence analysis of the

incidence of formulae with foundry shows a particular division between those inscriptions used by the Norwich foundry and the rest (Fig 11). However, when the location of bells bearing these inscriptions are plotted, it can be seen that this distinction is not as clear cut as it at first seems (Fig 12). Whereas the distributions of some inscriptions, such as Nos [saint] Meritis Mereamur Gaudia Lucis, do seem to be centred on Norwich, others, such as Dulcis Cisto Melis Campana Vocor, are rather more widely spread. The distribution of bells bearing the formula Virginis Egregie Vocor Campana [saint] even suggests that it may have been favoured by a second, undocumented, foundry in the Welsh Marches. This illustrates why the presence and absence of formulae have not been used as data in this study—founders were at liberty to use any inscription they (or their clients) wished. There is not the physical constraint of possession required for the use of a stamp.

Axes 2 and 3 of the correspondence analysis are shown in Figure 13. This appears to suggest further geographical trends in the use of formulae for inscriptions, with the second axis separating the West Country foundries from those in the east, and the third axis the south from the north. If, for example, the distributions of bells bearing those formulae most closely associated with the northern foundries are plotted, it is apparent that, although there may be an association between bells inscribed simply, Campana [saint], and the North, this is by no means exclusive (Fig 14). Indeed, another of these formulae, Missi De Celis Habeo Nomen [saint], seems to be as much associated with East Anglia and the southern Welsh Marches, as with the North.

Medieval bells are overwhelmingly inscribed in Latin (Fig 15). This makes the language of the inscription ineligible for use in their classification. Nevertheless there are some points of interest. Bells with inscriptions in other languages disproportionately bear evidence of date. For example, all eight Flemish bells are inscribed with their date of casting. Bells inscribed in English seem to be disproportionately late, as two thirds of those with independent evidence of date were cast after 1500.

The final aspect of inscriptions to be considered as potential variables for classification is the dedication of bells to saints. Dedications to only 23 saints account for 2833 of the 3237 bells with inscriptions mentioning saints (87.5%). The first two axes of the correspondence analysis of the abundance of these inscriptions on bells with external evidence of foundry is shown in Figure 16. The first axis shows a strong correlation between the Chesterfield foundry and bells inscribed with "ihc". However, when the

distribution of bells bearing dedications to Jesus are plotted (Fig 17), it can be seen that, although there is a concentration in the East Midlands which may be attributed to bells by the Chesterfield foundry, the distribution is widespread and there appears to be a second, undocumented, concentration in Somerset. The second axis perhaps suggests a connection between the foundry at Bury St Edmunds and St Barbara, which may be further demonstrated by the distribution of bells with this dedication (Fig 17). In neither case is the correspondence between a foundry and a saint exclusive, however, and so again there appear to be other significant factors for the choice of dedication than the foundry which cast the bell. Further axes of this correspondence analysis show no further strong correlations between particular saints and foundries.

Equally, the correspondence analysis of the generic formulae used for the inscription and the saint to which a bell is dedicated also shows little strong correlation (Fig 18), demonstrated by the fact that more than ten axes are required to account for all the variation. However, there is undoubtedly some functional relationship between certain formulae and certain persons. For example, all but one of the 336 bells bearing the salutation to the Virgin Mary (Ave Maria Gracias Plena) are dedicated to her. Figure 18 shows a similar relationship between St John and Resonet Campana [saint], In Multis Annis Resonet Campana [saint]), and [saint] Est Nomen Eius, St Augustine and Vox [saint] Sonet In Aure Dei, Christ or Jesus with Sit Nomen Domini Benedictum, Jesus Nazarenus Rex Judeorum Filii Dei Miserere Mei, and Est michi collatum ihc istud nomen amatum, and St Mary Magdalene and Nomen [saint] Campana Geret Melodie. Although there may be a preference for certain foundries to use particular formulae, and for these to be associated with particular saints, any such relationships are complex, involving contingency tables in more than two dimensions. Again, the necessity for the physical presence of a stamp in the foundry makes these data more suitable for classification, as a founder's choice is limited by physical access to a certain set of equipment.

Another complication which may be encountered, when considering dedications to saints on bells, is the relationship of this dedication to the patron saint of the church in which the bell is found. The number of bells dedicated to the commonly occurring saints (saints which occur on their own on more than 25 bells or churches) is shown in Figure 19. Dual dedications are not considered. In total 3299 churches are recorded with at least one medieval bell, this represents approximately 34% of listed churches with medieval fabric surviving in England (n=9764; http://www.imagesofengland.org.uk). Of these churches

2452 (74%) are dedicated to one of the 29 saints included in Figure 19. This also includes 2879 of the 3237 recorded medieval bells with dedications (89%). These totals are sufficiently large to suggest that Figure 19 is probably representative of the choices medieval people made in dedicating churches and bells.

It is immediately apparent that some dedications are more popular for churches than for bells (eg All Saints, St Peter), and some are more popular for bells than for churches (eg St Thomas, Christ). A correspondence analysis of the abundance of bells dedicated to the most common saints in churches dedicated to those same saints is shown in Figure 20. This suggests that there is a correlation between the dedication of a bell in the tower and that of the church. This is shown most strongly through the tendency of bells dedicated to St Mary Magdalene to be in churches with the same dedication, although there are similar trends for St George, St Andrew, St Michael, and several other saints (Fig 20). Once again, the selection of a dedication for a bell has been shown to be connected to factors other than the founder who made it.

Turning away from the evidence contained within inscriptions, the size, the shape, and the metal of church bells are very largely determined by functionality. The importance of carefully controlling these factors for the production of a sound casting of the required weight and note has been known since at least the thirteenth century (Hawthorne and Smith 1963, 167-76). Thus, although 3382 of the 4797 recorded bells (71%) have a recorded diameter, this is so closely related to the weight of the bell that the latter is often calculated from it (eg North 1876, 131). Elphick (1988, 9-10) demonstrates that the shape of bells may be diagnostic of both date and founder, and suggests that the trapezoid formed by the tangent of the bell from lip to shoulder, the diameter at the lip, the diameter at the shoulder, and the height to the shoulder should be compared. This may be a promising avenue of investigation, but at present only 22 bells (0.5%) have their tangent recorded, and only 194 (4%) an (unspecified) height. As the height of a bell may be measured from lip to shoulder, or to crown, or to the top of the canons, or to the top of the argent (Fig 6), this information is not usable.

There are other technological characteristics of bells which might be used as the basis for classification. A number of these seem to be indicative of the date of casting. The shape of a bell is, in itself, at least broadly related to its date (hence the utility of the tangent), and so bells noted as "long-waisted" or "with a domed crown" may be thirteenth century

or earlier (at least in the South). Equally, such early bells are frequently cast using the lost-wax method described by Theophilus (Hawthorne and Smith 1963, 167-76). Unfortunately as only 110 bells (2%) are described as long-waisted, 36 have their crown type recorded (1%), and only 12 have had their casting technique recorded (less than 1%), none of these characteristics can yet be used to provide a useful partition of the data. Elphick (1988, fig 3) provides a four-class typology of the shape of the lip of a bell. The first three classes of which may provide some means of dating early, frequently uninscribed, bells with more precision than is otherwise possible (ibid, fig 7). Again, only 46 bells have their lip type described, so this is not as yet a useful means of classification.

All medieval tower bells (and most sanctus bells too) were suspended by means of canons (Fig 6). Although these have been removed to allow for the removal of the iron, cast-in, crown staple and the installation of modern clappers on at least 388 of the bells in this study (8%), 151 have records of the decoration or moulding of the canons. It is probable that these mouldings and decorations were formed by wooden patterns which formed part of the founder's gear (Elphick 1988, plate XVII), and so in due course these might also be traced from founder to founder as are the stamps used in inscriptions. As these decorations have only been recorded so far for a few, mostly early, bells (Elphick 1970, plate I; 1988, 37-43), this also must be seen as an opportunity for the future.

Perhaps the most common diagnostic features of bells which have not been used for this study are the sequences of moulding wires (Fig 6). These are raised bands of metal (differing in section and breadth) which are cast into bells, most frequently at the lip, the soundbow, on the shoulder (to form the inscription band), and on the crown. These mouldings are almost universally present on medieval bells, their absence being so unusual that it merits special mention.[4] They appear to have originated as thin strips of wax applied to the lathe-turned model bell to hide joins between the wax sheets used in the early lost-wax method of casting.[5] They also serve to keep the inscription straight. All but the earliest medieval English bells, however, were formed using loam moulding and a strickle (Smith and Gnudi 1990, 260-72). This implement seems to have incorporated the shape of the mouldings, and so it is possible that the number and sequence of mouldings

[4] Only ten are recorded: at Southam, Gloucestershire (1282), Clarborough, Nottinghamshire (2454), Lydham and Uffington, Shropshire (2691 and 2719), Finningham, Suffolk (3189), Hardham, Sussex (3561), Appleby, Westmoreland (3717), Sherrington, Wiltshire (3855), and Skelton-in-Cleveland and South Kilvington, Yorkshire (North Riding)(4333 and 4337).

[5] This is shown on a bell at Hanford, Dorset (0800), where a beaded moulding wire hides the join of wax slabs between the waist and soundbow (Elphick 1988, 53).

may enable these tools to be traced from founder to founder in the same way as the moulds used for creating the inscriptions can be traced. Potentially they can also be used to attribute uninscribed bells to particular founders or foundries. Unfortunately, very little has been published on the mouldings on medieval bells (but see Elphick 1988, 53-5), and some details of the mouldings on only 392 bells are recorded (even this information has frequently been derived from published photographs of bells, rather than from deliberate recording).

1.3.3 The incidence matrix

Having chosen to utilise the stamps used in the inscriptions as the variables for this study, a table has been compiled recording the presence or absence of all known stamps on all recorded medieval bells. Each stamp has been given a unique numeric identifier (in the form 0.0000) and is listed and illustrated in Appendix 1. Each bell has also been given a unique numeric identifier (in the form 0000) and is also identified by the name of the parish in which it is first recorded (Appendix 2). Overall the matrix contains records of the incidence of 1116 types on 3390 units (Appendix 3). In this study the types under consideration are stamps, and the units are bells. For simplicity, hereafter types are described as stamps and units are described as bells (although types and units are the terms which appear in the methodological literature).

This incidence matrix is a specialised form of contingency table (in this case an I x J two-dimensional matrix), containing binary (presence/absence) data rather than counts. The data are categorical, qualitative, and nominal.

1.3.4 Merits and demerits of stamp data

The reasons for selecting the stamps as data have been described above. The approach to the choice of variables has been both theoretical and pragmatic. There is an archaeological expectation that the variables (stamps) will conform to the selected models (see §1.5 below). All stamps and bells have been included in the analyses. Where sub-sets of data have been run separately, there are mathematical criteria for the selected partitions. In no case has the results of an analysis affected the selection or definition of the variables to be included in the application. Pragmatism has intruded only because of limitations set by the data recorded by previous workers. This is in marked contrast to

many applications. Indeed, it has even been advocated specifically that "the relationship between typology and seriation (however the latter is done) is an interactive one, and it should be virtually standard practice to consider modifying a typology to see what effect that has on, and so whether one might improve, a sequence produced" (Hines 1999).

The use of stamps as variables also means that the data are all categorical. Although there are characteristics of bells which could form data on a continuous scale, these are not considered in this study for the variety of theoretical and pragmatic reasons described in the previous section. Confining the data to one class of variable avoids many of the mathematical difficulties encountered when considering applications with mixed data (Baxter 1994, 18-19).

These advantages are balanced by two problems. Firstly, there is the significant amount of missing data in the incidence matrix, and secondly there are inaccuracies.

Fortunately the existence of missing data is suspected, and can be at least partially quantified, on the basis of the known data. Of the 4003 bells recorded as having an inscription, 362 are of unknown type. This means that we do not even know whether the lettering is in capital or minuscule, let alone which set of stamps was used. Of the 2049 bells recorded as bearing minuscule, only 525 (26%) have the stamps of the minuscule recorded. Capitals have been rather more widely recorded, with 1595 of the 3334 bells with capitals having their alphabet identified (48%). The situation for crosses is probably rather better, although this cannot be so convincingly demonstrated. Of the inscribed bells in this study, 2559 have at least one cross recorded (64%). It is probable that the other 32% of bells have the record of their cross missing, as it is so unusual for an inscribed bell not to have an initial cross that it is noted where there is none (eg 0028, Northill, Bedfordshire; North 1883, 175).

Given the known proportion of missing data in the incidence matrix, I have adopted a *passive* approach to such data (ie it has been ignored (van de Geer 1993, 4)). This is attractive because, in the analysis of the data, it is assumed that bells bearing the same stamp(s) are similar, whereas it is not assumed that those without a stamp are similar. In other words, a presence is more significant than an absence. This intuitively seems sensible, not just as a pragmatic response to missing data, but because a founder may have chosen not to use two stamps on the same bell even if both were contained in his

tool-kit. On the other hand, even a single presence of two stamps on the same bell is proof of contemporaneity.

In addition to the problems of missing data, the potential for inaccuracy in the dataset must be faced. The logistics of visiting medieval bells mean that the collation of this data has been the work of many hands over more than 150 years—checking it all within a single lifetime, let alone the timescale of this study, is impossible. Although it obviously became easier to identify particular maker's marks as the basic groundwork was completed and stamps illustrated, neither date nor author is a guarantee of reliability. For example, the Rev H T Ellacombe "by the curteous hospitality and very kind assistance of many friends" was able "to visit every old tower in the county" of Devon (Ellacombe 1872). By contrast, for his *Church Bells of Gloucestershire* (1881), he relied on "correct returns from the clergy and other gentlemen" and the "valuable collections" of other bell-hunters. Thomas North, due to the lung disease which invalided him at the age of 42, perforce also had to rely on inscriptions and marks "being supplied by clergy and others who had not always the requisite special knowledge" (Anon 1888, 92). Inaccuracies are inevitable in such circumstances.

The utility of the information contained within a work to this study may also depend on the objectives of the author. Although most of the county histories were written in the spirit of Victorian antiquarianism, Lynam (1889, iv-v) specifically aligns his work with the Arts & Crafts movement rather than purely archaeological study. While this perhaps led to rather less analysis of foundry lines than is common in other works, his volume is a work of art in its own right and every mark and lettering set on every medieval bell is illustrated—a feat still without parallel.

In models where a single co-occurrence is significant, erroneous records of the presence of certain stamps together on a single bell can substantively effect the analysis. Presence and absence data are not robust against inaccuracies.

1.4 Choosing the mathematical techniques

It could be said that this study commits one of the cardinal sins of statistics in archaeology (deliberately!), by using a number of different techniques to analyse the data

in the search for "good" results (Baxter 1994, 5 quoting Krzanowski 1988, 94-5). Much better to define the objectives of the analysis and the characteristics of the data, and choose the technique best suited to the question from the outset. The problem is that this is easier said than done. This is because it is generally very difficult to predict the ways in which archaeological data may conflict with the assumptions of a particular technique before analysis.

Alternatively, a number of different methods may be applied, in the hope that the results will be consistent with each other, as well as with any external information relevant to the problem. Consistency suggests that the pattern observed may reflect real structure in the data rather than be an artefact of the method selected.

The advantage of this study is that "good" is defined by an external standard (Chapter 2). Because of this, it is also possible to estimate the characteristics of the data in order to select the most appropriate technique with rather more confidence than is possible for most archaeological applications. All results are also discussed (see Chapters 3 and 4)—the "good" ones have not been reported preferentially. Otherwise it is simply those techniques which have been frequently used on binary data in archaeology which have been applied in this study.

1.5 *A priori* expectations

Based on the interpretation that bell stamps represent physical pieces of equipment which were present in a founder's tool-box, and on the mass of documentary evidence on medieval bell founding (some of which is discussed in Chapter 2), it is possible to anticipate the structure which may be present in the incidence matrix. How this relates to the models and assumptions underlying specific mathematical techniques is discussed more fully in Chapters 3 and 4. Here a more general outline is provided.

Underlying the structure are some basic facts. Each medieval bell was cast by a founder at some particular point in time. At this time the founder may or may not have been associated with a particular foundry. However, at that time, he did possess the stamps used on the bell. These stamps may be unique to the founder or workshop, inherited from his predecessors, and or bequeathed to his successors.

Figure 21 shows an entirely imaginary sequence of founders and stamps from three generations of two (contemporary) foundries.

So, for example, Richard I works in Foundry A and has access to capital lettering sets A, B, and C, minuscule sets a and b, crosses +1, +2, and +3, and trademark T1. Bells bearing some or all of these marks will form a cluster of bells by Richard I. There may however be correlation between sub-sets of the stamps used on bells by Richard I because of the different functions of the stamps. For example, if the first stamp selected for a bell is capital set A, then another sets of capitals may not be required for the inscription. Consequently there will be a lower probability that the second stamp selected is another set of capitals (B or C), than that the second stamp selected is a minuscule or cross.

Richard I dies and is succeeded in the business by his son, Richard II. He uses capital sets A and B, minuscule set b, and crosses +1 and +2 from his father, and creates a new set of minuscules (c), three new crosses (+4, +5, and +6), and a new trademark (T2). Again bells bearing some or all of these marks will form a cluster of bells by Richard II. But what about bells bearing stamps A, b, and +2 only? Should they be allocated to Richard I or Richard II? As there is no way to tell, these bells must fall in between the two clusters of bells allocated to Richard I and Richard II (Fig 22). Consequently we now have three clusters joining to form a continuum, bells by Richard I bearing one of his trademarks (stamps only used by him: C, a, +3, or T1), bells bearing only stamps used by both Richard I and Richard II (A, b, and +2), and bells bearing one of Richard II's trademarks (considering the succession to Richard III: +5 and T2). These stamps used by only one founder and acting as trademarks, can be considered as archaeological type fossils. It should be noted that, although the analysis of the incidence matrix may form three groups, or simply one joined together, there are, in reality still only two clusters, given that the bells concerned were either cast by Richard I or by Richard II. It is just that these clusters overlap.

Until now, we have only considered Foundry A. However, supposing there is a second, contemporary foundry, Foundry B, that uses an entirely different set of stamps. So, for example, bells by Richard I and William I, although contemporary, will form entirely separate clusters because they were cast by different workshops. These parallel series, however, break down on the death of William II. He had no sons and so was succeeded in

the business by his nephew, Robert I. However his daughter, Johanna, married Richard III taking with her capital set Y. This marriage joins the groups formed by Foundries A and B (Fig 22).

This scenario suggests that problems may be encountered in achieving partitions in the data which consistently define groups of bells by particular founders, or even groups of bells from the same foundry. Perhaps this is a consequence of applying relatively simple mathematical models to a complex society. Documentary evidence for medieval bellfounding not only provides evidence for exogamy,[6] but also of remarriage,[7] migration,[8] business associations between founders,[9] and the commercial acquisition of foundries.[10]

Chronology and classification are entwined. As ever, the problem is to distinguish variation in the archaeological record caused by time, from that determined by context.

[6] eg Robert Newcombe who married Katherine, daughter of Thomas Bett (see below §2.2.4.2).

[7] eg Margery, who married successively William Millers, Thomas Newcombe I, and Thomas Bett, all bellfounders of Leicester (see below §2.2.4.1).

[8] The most secure evidence of migration is that of William Hasylwood who appears to have moved the Wokingham foundry to Reading *c* 1494-5 when the (lost) churchwardens' accounts of Thame, Oxfordshire, record the abortive visit of men on horseback to acquire bells at Wokingham who were then redirected to Reading to purchase bells from him (Cocks 1897, 58). Less secure, but intriguing, evidence is provided by John Gosselin. A man of this name appears in both the will of John Barber, bellfounder of Salisbury (died 1404) and Alice, his wife (died 1408)(Tyssen 1908, 351-62). In 1429-30 "John Goslyng, bellmaker" paid 20s for his seat in the church of All Saints, Bristol (Burgess 1995, 61). In 1438 he is recorded as holding a tenement from the Abbot of St Augustine's for 4d (Veale 1931, 305), and in the same year was proctor, with Thomas Halleway, of All Saints (Burgess 1995, 72-5). He was a common councilman of Bristol in 1438-9 (Bickley 1900, i, 86-8; Bickley 1900, ii, 169), and bailiff in the following year (ibid, 161). He is described as 'belyetter' and burgess of Bristol in his will which was written on 12 May 1450. Although he is again described as a common councilman in Bristol on 10 June 1451 (Veale 1933, 129), he was dead by 22 May 1452 when his will was proven (Wadley 1886, 133; Fry 1897, 124; Tyssen 1908, 368).

[9] In addition to the partnerships of John Baly and Richard Brasyer II (see below §2.2.4.6) and John White and John Saunders (see below §2.2.4.9), there is the mysterious "Bellmakers' Guild" mentioned in a list of London Guilds drawn up *c* 1420 (Stahlschmidt 1884, 48; Tyssen 1916, 19).

[10] For example, Thomas Lawrence who purchased the lease on William Culverden's premises and "all the implements belonging to the craft of a bellfounder" for £120 before the latter wrote his will on 29 September 1522 (see below §2.2.3).

CHAPTER 2

THE STANDARD

It has been demonstrated that medieval bells were frequently inscribed, using lettering and devices which were placed into the mould and cast in bronze. The information which can be derived directly from these inscriptions distinguishes this data from the majority of archaeological datasets. It provides evidence for the founding of the bells external to the incidence matrix. The comparison between the results of various numeric approaches to the analysis of the incidence matrix and this independent data forms the basis of this study.

Firstly, however, what is known about individual bells and the founders who cast them must be determined rigorously. The critical link is that between people who appear in the documentary record and the physical bells—too often this link is entirely circumstantial, with a group of bells attributed to a founder simply because he was working in the right place at the right time and has not been otherwise allocated a group of bells. It is therefore necessary to deconstruct over a century and a half of antiquarian study into medieval bell-founding, to determine which attributions are secure.

Bells are assigned to 89 documented founders in this chapter, 51 of whom cast bells which appear in the incidence matrix examined in Chapters 3 and 4. This means that almost 60% of the cases (126 out of 215) in which particular groups of bells have been allocated to documented bellfounders in the published literature have been considered too insecure to serve as part of the standard used here to assess the reliability of the statistical analyses. In most cases this is because the link between the bells and the founder is based on either an (informal) consideration of the occurrences of stamps, or the typological characteristics of the bells themselves, or the spatial distribution of a group of extant bells (or a combination thereof). In these cases there is no independent evidence to connect the bells with the founder. For example, Tilley and Walters (1910, 5-6) assign a group of seven bells in the West Midlands[1] to 'Sandre of Gloucester'. A seal of fourteenth-century character bearing this name around a bell and laverpot was found in the river Thames *c*1850 (Anon 1856, 73). There is nothing to connect this seal with the bells, bar the spatial distribution of the surviving examples and the 'early' character of the Lombardic capitals

[1] Credenhill and Thruxton, Herefordshire (1481 and 1571), Sapperton and Turkdean, Gloucestershire (1272 and 1296), Clapton-in-Gordano, Somerset (2794), Atherstone-on-Stour, Warwickshire (3637), and Besford, Worcestershire (3901).

with which they are inscribed. There is no evidence to suggest that such an attribution is implausible, but neither is there any to suggest that it may be valid.

In this chapter an attempt is made to assess critically the links between particular bells and documented founders (see §2.2 and §2.3 for the criteria which have been used for this). It should be noted that this assessment is almost entirely based on published sources, many of which were written more than a century ago. Consequently it is likely that modern historical research will lead to the rejection of some of the identifications presented here[2], and suggest further, or alternative, identifications for other bells and founders. In particular, some of the antiquarian identifications made on the basis of heraldic devices and badges may be unreliable.[3] Having said this, from our present state of knowledge, it is unlikely that the number of erroneous identifications in the standard presented here is sufficient to influence the conclusions of this study substantively.

Excluding typology, there are two principal sources of information about medieval bell foundries. Firstly, there is the content of the inscriptions and marks cast on the bells themselves and, secondly, there is a mass of documentary evidence which mentions bellfounders and bell-foundries, some of which can be related to particular bells or stamps. Before coming to the detailed critique of this information, necessary if we are to use this data as a standard to compare with the results of mathematical models, some general points should be made.

It is clear from documentary sources that there were a number of contemporary bellfounding centres in medieval England (Fig 23). The largest by far was in London where the names of over forty bellfounders have been unequivocally identified in records, and where two independent foundries appear to have been active for much of the fifteenth century. London was the only centre large enough to sustain two competing bellfoundries for an extended period during the Middle Ages. Next in size was the foundry at York, where the names of about thirty founders have been identified. Bellfounding was carried in these two centres more or less continuously from the late thirteenth century, when bellfounders first become identifiable in the documentary record, until the Reformation.

[2] see below fn 9 for discussion of Simon de Hazfelde.
[3] see below fn 32 and fn 40 for discussion of the attributions of badges 3.0001 and 3.0002 to William Chamberlyn and the half-groat (2.0107) to John Sturdy.

No more than a dozen craftsmen have been identified in the medieval archives of any other town in England, although there were active foundries for much of the medieval period in Bristol, Gloucester, Leicester, and Worcester, and for part of the period in Bury St Edmunds, Chesterfield, Exeter, King's Lynn, Norwich, Nottingham, Salisbury, and Reading/Wokingham.

Bellfounding is recorded sporadically in other locations, although no other centre reached even regional importance. Generally, records point to activity in these places being confined to individual craftsmen, such as John le Belytere in Shrewsbury, who is mentioned in 1344 and 1356 (Walters 1912, 201; Walters 1915, 401), or to a couple of generations of the same family, such as John Rofforde, who was appointed Royal Bellfounder by a patent of Edward III, dated 20 June 1367 (Anon 1912, 408-9; Cocks 1897, 10-11), and William Rofforde "Belmaker of Todyngton" who impleaded Adam Portreve and Hugh Sterthout for £10 13s 4d in 1398 (Anon 1909c, 306; Cocks 1897, 18-19).

This general review of the documentary evidence is important because it identifies fourteen foundries of national or regional significance which were active during the medieval period. The survival of records and the quantity of documentary research which has been completed for each foundry is patchy, but it is unlikely that any major centres of production are entirely missing from the historical sources, or that any major foundry is entirely missing from the sample of surviving bells. Bellfounding has also been identified on a smaller scale in another dozen or so towns, although it is likely that more of these remain to be identified in the records. There is certainly archaeological evidence of bells being cast in places where no founders are currently known from documentary sources (eg in Winchester; Biddle 1990, 102-24), although some of these finds may well be the products of itinerant craftsmen based elsewhere (eg John of Gloucester who cast bells at Ely Cathedral in 1346; Raven 1882, 5-8).

2.1 Cast in bronze

Turning to the detailed attribution of particular bells to founders or dates, we start with bells where the information is unequivocal. This is when an inscription includes the name of the person who cast the bell, usually employing the simple formula "[person] Me

Fecit". Bells can be assigned to a foundry and dated if the founder appears in documents which reveal the location of the workshop and when he was working. Unfortunately there are only 136 medieval bells known which give the name of the maker (approximately 3% of the 4797 which have been recorded), and not all of these founders have yet been traced in the documentary record.

2.1.1 Bells bearing the names of fourteenth-century London founders

There are many bells cast in London during the fourteenth century to be considered, turning first to those cast by members of the Wimbis family. Michael de Wimbis cast his name on five surviving bells in Buckinghamshire,[4] and was alive in 1297 when the rolls of the Hustings Court record a deed made between Michael le poter and Adam de Wirlee and Margaret his wife, daughter of the said Michael (Stahlschmidt 1884, 4-5). Michael was dead by 1310 when another deed enrolled in the Hustings Court describes this couple as "Adam de Wyrle and Margaret his wife, daughter of Michael de Wymbish, late potter" (Stahlschmidt 1884, 6; Boughey 1919, 75).

Another member of this family, Richard de Wimbis, cast his name on six widely spread bells.[5] The bell at Goring is inscribed "ORATE PRO PETRO EXONIENSE EPISCOPO / RICARD DE VVYMBIS ME FIST". Because the prayer is for the Bishop, and not his soul, Bishop Peter must have been alive when this bell was cast. Bishop Peter de Quivil of Exeter held the see between 1280 and 1291 (Sharpe 1953, 144-9). This is the earliest evidence for Richard's career as a bellfounder. He first appears in the London records on 25 April 1296 when he was one of the citizens who organised aid for the king in defending the south coast (Sharpe 1901, 22-4). On 4 March 1299 we find him acting on behalf of the children of John de Stortford when they became wards of Gilbert de la Marche (ibid, 33). On 7 July 1303 he acted as a member of a jury for appraising the value of pledges for debt (Riley 1868, 47). Stahlschmidt (1884, 7) found his name occurring several times in the Hustings rolls between 1307 and 1313, from which we learn that his wife's name was Hilditha. In 1312 he cast a bell for the conventual church of the Holy Trinity, Aldgate (Riley 1868, 100; L'Estrange 1874, 53), and he is finally noted as "potter of Alegate" in 1315 (Clouston and Pipe 1980, 13).

[4] Bradenham, Lee, and Old Bradwell (0115-6, 0155, and 0167-8).
[5] Cholsey, Berkshire (0059), Berechurch, Essex (0977), Burham, Kent (1665), Slapton, Northamptonshire (2386), Goring, Oxfordshire (2563), and Great Bradley, Suffolk (3209).

The final member of the Wimbis family, Walter, has not been found in the documentary record, although his name appears on a bell at Kingston-by-Lewes, Sussex (3572).

Paul le poter, who left his name on a bell at West Challow, Berkshire (0101) first appears in 1297 as a witness to the deed between Michael le poter and Adam de Wirlee (Stahlschmidt 1884, 5). Under 13 March 1303 the close rolls of 31 Edward I record "Paul le Poter of London acknowledges that he owes Adam de la Rose, 'poter' £60" to be levied from chattels and lands in London and Kent (Anon 1908, 77). On 13 December the same year he appears in connection with a trade offense committed by Thomas de Wrotham (Thomas 1924, 153), and on 17 November 1307 he attended the Assize of Nuisance in a case against John de Wynton, barber (Chew and Kellaway 1973, 26). On 6 June 1311 he stood surety for Adam, son of Adam atte Rose, potter who was charged with assault (Sharpe 1902, 260-1), and on 20 November that year his will was enrolled in the Court of Husting, London (Sharpe 1889, 225).

Moving into the 1320s, we come across Peter de Weston. His name is recorded on six bells.[6] It has been often stated that he first appears in the City records in 1328 (Cocks 1897, 9; Walters 1912, 383; Draper 1951, 312; Sharpe 1970, 179), although the first substantiated reference is in 1330 when he appears in the will of Henry in the Lane as guardian of his son, William (Stahlschmidt 1884, 14-15). On 14 September 1334 he was a collector for the fifteenth in Portsoken ward (Sharpe 1904, 3), and on 24 February 1337 "Peter de Westone, pottere" lent 20s for the King's wars (ibid, 8). On 17 June 1337 he is recorded as a neighbour of John, son of William de Redebourne, in Portsoken ward (Sharpe 1903, 190; Deedes and Walters 1909, 8), on 29 September 1339 as a neighbour of Martin le Meleward (Sharpe 1903, 236-7), and on 13 January 1340 as a neighbour of William Noreys (ibid, 247-8). In 1346 he acted as an assessor for Portsoken ward and was assessed (Sharpe 1904; 143, 147, 150), and in 1347 he headed the list of common councilmen for the ward (Stahlschmidt 1884, 17). On 24 August 1347 he wrote his will, and he had died by October of the same year when it was enrolled (Stahlschmidt 1884, 17-18; Sharpe 1889, 496; Draper 1951, 312).

William Schep, whose name has been recorded on two bells,[7] was working during the same period as Peter. He is first recorded in the lay subsidy roll for 1319, paying 5s 4d in

[6] Marlston, Berkshire (0081), Tattenhoe, Buckinghamshire (0184), Fairstead and Ingatestone, Essex (1013 and 1051), Kingsbury, Middlesex (2303), and Ambrosden, Oxfordshire (2534).
[7] Leckhampsted, Berkshire (0079) and Garboldisham, Norfolk (4475).

Aldgate ward. On 13 January 1324 he appears as a neighbour of that Walter le Taillour de Faveresham in Lymstret who was killed (Sharpe 1903, 108-9). On 7 July 1326 he was a juror in the case of the death of John de la Marche (ibid, 161-3), on 24 February 1337 he contributed 10s to the subsidy for the King (Sharpe 1904, 8), and on 28 October "William Sheep, pottere" appeared as a witness (ibid, 19). He was elected a watchman for Alegate ward on 19 April 1338 (ibid, 22) and is recorded as a neighbour of Ralph Sarasyn of Twycros in the same ward on 29 September 1339 (Sharpe 1903, 235-6). On 24 August 1347 he is mentioned as a tenant in Peter de Weston's will (Stahlschmidt 1884, 18), although he was dead by 25 March 1348 as Peter de Weston's widow, Matilda, bequeathed to her son Thomas the tenement "quod quondam fuit Willelmo Schip" (Sharpe 1889, 621).[8]

Spanning the great outbreak of the Black Death, the first bellfounder we encounter is Simon de Hazfelde whose name appears on bells at Sutterton, Lincolnshire (1530) and Stanwick, Northamptonshire (1635). In 1407 the London Possessory Assizes record a dispute on 17 April 1343 concerning the grant of a tenement in the parish of St Olave by the Tower by "Simon de Hathefeld, citizen and potter" to the Crutched Friars (Chew 1965, 96-8). On 20 August 1343 a license was granted Simon Pottere to alienate the tenement to the Prior in fee simple, although this is dated 28 August in the patent rolls of 17 Edward III (Chew 1965, 96-8; Anon 1902b, 115). In 1351 "Simon de Hatfeld, pottere" swore to keep the ordinances regulating wages in Portsoken ward (Sharpe 1904, 212) and in 1357 he witnessed the will of William de Raughton (Stahlschmidt 1884, 25).[9]

In 1351 Robert Rider swore to keep the same ordinances as Simon de Hazfelde in the ward of "Lymstrete" (Sharpe 1904, 212) and on 25 March 1356 he is recorded as a common councilman for Aldgate ward (Sharpe 1905, 60). In August 1369 he was a collector for the fifteenth in the same ward (ibid, 252) and on 5 December 1370 "Robert Ridere, brasiere" stood surety for the inheritance of the children of Stephen atte Pye (ibid, 270). He wrote his will in January 1386 and was dead by 1387 when his two wills (one

[8] Thomas de Weston appears to have left this tenement within Algate which he had by devise of Peter Weston, late potter, to John his brother by his will dated 12 April 1349 (Sharpe 1889, 572).

[9] There is considerable doubt over this identification on etymological grounds, as 'Hazfelde' is not yet known to have been spelled 'Hatfield'. In fact the 'z' is a very unlikely letter in this position, and may be a mis-recording of a yogh. This would indicate a modern name form such as Hayfield, Heyfield, or Hagfield (Keene pers comm 2006).

for moveables, one for immovables) were proven in the London Archdeacon's Court (Stahlschmidt 1884, 32-4). His name is inscribed on three existing bells.[10]

Another six bells bear the name "WILELMUS REVEL".[11] He only appears in one document, in 1357 as a legatee in the will of William de Raughton (Stahlschmidt 1884, 22-5).

In the later fourteenth century London founders ceased to inscribe their names on their bells and moved instead to the use of foundry marks (see below §2.2.3), and so it is now time to turn away from the metropolis.

2.1.2 Stephen Norton of Kent

Five bells are recorded as inscribed with the name "STEPHANUS NORTONE DE KENT" in various forms.[12] That at Dover Castle, before being scrapped in the early eighteenth century, was also inscribed with the date, 4 Richard II (1380-1), and the name of the donor, Robert de Aston (Deedes and Walters 1909, 12).

Stephen is first mentioned on 8 July 1362 when he appears in the Feet of Fines with his wife Johanna, selling 8 acres of arable in Goudhurst (Stahlschmidt 1887, 17). On 20 January 1364 he again appears in the Feet of Fines buying two houses and 55 acres of arable in Boughton Monchelsea (Stahlschmidt 1884, 26). In 1375 he appears in a conveyance for property in Wrotham (Raven 1906b, 86) and on 3 December 1379 "Stephen de Norton, of the county of Kent" appears in the patent rolls of 3 Richard II in connection with a license for marriage of 80 marks (Anon 1895, 406). On 6 May 1386 "Stephen Norton of Chart" again appears in the patent rolls in connections with a license to enfeoff lands in Elmley (Anon 1900b, 145). In this year he also brought an action against the Dean and others of South Malling for £58 (Elphick 1970, 47; , citing BL, Add MS 3937, although this appears to be an incorrect reference). On 27 April 1390 "Agnes daughter of Stephen Norton 'belmakere'" is mentioned in a charter recorded in the close rolls of 13 Richard II (Anon 1922b, 170), and on 25 June he is himself mentioned in the patent rolls in connection with escapes from the King's jail at Middleton (Anon 1902a,

[10] Ridgewell, Essex (1115), Hartley, Kent (1713), and Ford, Sussex (3558).
[11] Strethall, Essex (1129), Longfield and Stanford, Kent (1733 and 1781), and Hassingham, St Lawrence Norwich, and Rowdham, Norfolk (4505, 4619, and 4667).
[12] Holy Cross, Canterbury, St Mary in Castro, Dover, and Snave, Kent (1669, 1693, and 1779), Etchingham, Sussex (3549), and Chiselborough, Somerset (2788).

340). On 28 May 1392 he is mentioned in a license for the alienation of mortmain of lands in Marden (Anon 1905b, 68; Elphick 1970, 46) and on 26 June he appears again regarding the alienation of mortmain of three messuages, 68 acres of land, and 8d of rent in Smarden (Anon 1905b, 104). He is last recorded in a return to a writ of enquiry in 1394 (Tyssen 1915, 23). The will of John Maplesden (died 1528) demonstrates that he was buried in the parish church at Maidstone (Ellacombe 1875, 11). These records show that he was the bellfounder and was very much "of Kent", although the precise location of his foundry is not clear.

2.1.3 Bells bearing the names of founders from King's Lynn

Moving to East Anglia we come to the sixth bell at Salle, Norfolk (4671), which is inscribed "EDMUNDUS DE LENNE ME FECIT". Edmund Belleyetere became a freeman of Lynn by purchase on 15 December 1344 (Rye 1913, 8; Ingleby 1922, 190-1). On 9 July 1347 he accepted 2d compensation from John, son of John de Reynham (Owen 1984, 414-18), and he was elected to the council of Lynn at Michelmas in 1350 and 1357 (Ingleby 1922; 57, 169). In 1353 he was owed 4s for an old bell by the chamberlain of Lynn Bishop (L'Estrange 1874, 22). This founder should not be confused with Edmund Belleyetere, son of Thomas Belleyetere, who was not a bellfounder[13] (Cattermole 1990, 203; *pace* L'Estrange 1874, 22-3; Deedes and Walters 1909, 74).

Bells at Trunch and Wood Rising, Norfolk (4661 and 4726) are inscribed with words including "THOMAS DE LENNE ME FECIT". These can be assigned to the Thomas Belleyetere who is assessed at 2s 8d in the lay subsidy roll 28 May 1333 (Ingleby 1922, 111-12; L'Estrange 1874, 22; Richards and Oakley 1966, 142). He was one of four chamberlains for Lynn in 12-13 Edward III (HMC 1887, 217) and on 5 April 1339 a

[13] This Edmund was admitted into the freedom of Lynn by apprenticeship on 13 March 1364 (Rye 1913, 16; Ingleby 1922, 78). He had an active political career, being a member of the council of Lynn almost continuously throughout the last quarter of the fourteenth century, holding various offices including that of mayor in 1390, 1394, 1399, and 1403 (Rye 1913, 29; Ingleby 1922, 4, 9, 54; Anon 1905a, 298). He was a member of Parliament for Lynn in the mid 1380s (Ingleby 1922, 27, 40, 164; HMC 1887, 157), and held various royal commissions between 1382 and 1403 (Anon 1897b, 180; Ingleby 1922, 166; Anon 1909c, 99, 229, 239, 436; Anon 1905a, 298; Anon 1907a, 30). Later in life he appears to have found public office a burden, and the patent rolls record exemptions from public office in 1383-4 and 1406 (Anon 1897b, 364, 389; Anon 1907a, 198). In the latter he is described as "Edmund Belyetter of Lenne, merchant, who has completed the age of 68 years", demonstrating that he cannot be the bellfounder. He drew up his will on 9 July 1417, and it was proven in Norwich on 12 May 1418 (L'Estrange 1874, 22-3; [illegible] 147). He appears to have had no connection with bellfounding, but to have been a wealthy merchant engaged in trade of all kinds. For instance, he first appears with a license to export wool from the port of Lynn in the patent rolls of 38 Edward III (1364) (Anon 1912, 17) and in 1385 he appears in a list of Lynn

tenement he let to Johan Burghard is mentioned in the latter's will (Ingleby 1922, 140-6). On 18 February 1340 he appears in the Red Register of Lynn and on 24 February 1341 he was an executor for the will of Johannan de Thornegge (Ingleby 1922, 193, 159-61). His name also appears in a Lynn chamberlains' account for 1343/4 (Owen 1984, 385-90; Cattermole 1990, 200). He is last mentioned standing sponsor to John de Swofham and Simon de Ringstede on their admission to the freedom on 28 January and 18 February 1343 respectively (Ingleby 1922, 189). He was the father of the second Edmund Belleyetere, with whose son, also called Thomas Belleyetere, he should not be confused.[14]

It is probable that three further bells which bear the same lettering and the name "THOMAS" can also be assigned to this founder, although in the absence of more than a Christian name in the inscriptions these attributions cannot be regarded as entirely independent of the incidence matrix (Babingley, North Tuddenham, and Long Stratton, Norfolk (4366, 4587, and 4546)). The latter bears the name of Sir John Sturmin who is recorded as lord of the manor in 1327 (L'Estrange 1874, 77).

The two larger bells at Great Walsingham, Norfolk (4491-2) can be attributed to William Silisden whose name is inscribed upon them. He was admitted to the freedom of Lynn on 23 January 1377 (Cattermole 1985, 396; Ingleby 1922, 129; Rye 1913, 21) and was assessed at 3s 4d for the poll tax of 1379 (Owen 1984, 232). He was an assessor for taxes in 1382, 1386, and 1390 (Ingleby 1922, 30-1, 155, 163) and was elected one of the chamberlains of the town in 1384/5 and 1395/6 (Ingleby 1922, 15; HMC 1887, 223). On 28 May 1393 "Johannes Silesdene filius Willelmi Silesdene de Lenna" became a freeman of Lynn by purchase (Rye 1913, 28; Ingleby 1922, 5). Less happy times followed as in 1394 he appeared before the council in Lynn charged with making false tax returns, and had to pay a fine of 20s (Ingleby 1922, 8; Cattermole 1990, 201). He sold metal to the Master of the Cellar at Norwich Cathedral Priory for £12 in 1400/1, and wrote his will on 6 February 1409 (Cattermole 1990, 201).

John de Riston cast his name on a bell at Bexwell, Norfolk (4385). "John de Riston, belleyeterere" was admitted to the freedom of Lynn on 23 July 1385 (Rye 1913, 25;

merchants whose goods and chattels were impounded in Prussia, possibly by pirates, loosing the considerable sum of £108 (Owen 1984, 332-3; Cattermole 1990, 203).

[14] This second Thomas administered his father's will, and was also unconnected to bellfounding.

Cattermole 1990, 202) and appears in a lawsuit against Robert Brasyer of Norwich, whose agent he may have been, in 1390 (Cattermole 1985, 397, citing PRO, CP40/519).

Two bells can be attributed to John Godynge,[15] who appears in a dispute concerning the finances of Lynn in 1411/12 in a context which suggests that his foundry lay outside the borough (Owen 1984, 393; HMC 1887, 193). His will, which suggests that he came from Sedgeford, was proven in Norwich on 9 October 1454 (Cattermole 1990, 202).

Four bells bear the name "DERBY" in their inscriptions.[16] These bells can be ascribed to the "Thomas Derby of Lenn, belleyeter" who became a freeman of Lynn in 1450 (Rye 1913, 51; Cattermole 1990, 203). They were not cast by Henry Derby of London, who was an ironmonger (*pace* Stahlschmidt 1884, 74).

One further bell may be attributed to the Lynn foundry. This is the bell at West Somerton, Norfolk (4745) which is inscribed "IOHANNES DE LENNE ME FECIT". L'Estrange (1874, 22) quotes the tallage roll of Lynn Bishop in 1299 which refers to "Magister Johannis, fundator campanarum". This may be the same man, but John is rather too common a name for certainty.

2.1.4 Bells bearing the names of founders from Norwich

The former tenor bell at St John de Sepulchre, Norwich (now at Erpingham, Norfolk; 4617) is inscribed "Has Campanas Tu Formasti Pottere Thomas". "Thomas Potter, Brasyer" was admitted to the freedom of the city of Norwich in 1404 (L'Estrange and Rye 1888, 111; L'Estrange 1874, 25), although he was trading before this as the treasurer's roll of Norwich for 1395-6 records "To Thomas Potter for a brass soket to the capstane, 4s" (Hudson and Tingey 1910, 51). In 1418 he is recorded in a deed purchasing a property in Wastlegate, in the parish of St Stephen, together with Peter Bonde and John Huberd (Cattermole 1990, 150). He probably died between April 1427 and April 1428 because the records of the Gild of St George record the receipt of alms from his exequies during this period (Cattermole 1990, 150). The bell from St John de Sepulchre bears the three-legged pot stamp (7.0019). Although commonly associated with founding, when associated with a founder named "Potter", the appearance of such a device suggests that it

[15] The tenors at Worlington, Suffolk (3460) and Wendling, Norfolk (4737).
[16] Burnham Deepdale and New Houghton, Norfolk (4412 and 4577), Ampton, Suffolk (3084), and Chippenham, Cambridgeshire (0230).

was used as a foundry mark. The other eleven bells with this stamp can therefore be assigned to Thomas Potter working in Norwich during the period 1395-1428 (Appendix 3).

Slightly later in date we find a founder named Richard Baxter also working at Norwich, although he does not appear in the rolls of the city. His name is inscribed on three bells in Norfolk.[17] He first appears in the records of the college of the Blessed Virgin Mary at Mettingham in 1416-17 as follows: "Itm solut' Ric'o Baxstere p' ij campanis & p' ferr' faciend' p' eisdm' cu' vjd solut' joh'i Barkere p' campana carriand' Norwic' vsq' Metyngham lxjs viijd" (L'Estrange 1874, 27). In 1423 he describes himself as "brazier and citizen of Norwich" in a deed once preserved in the church chest at Northwold, Norfolk but now in the Norwich Record Office (L'Estrange 1874, 27; Cattermole 1990, 150, citing NRO, PD373/191). We next encounter him in the treasurer's roll of the city of Norwich for 1426-7 which records "To Richard Baxter, bracyer, working 34lb of the community's brass for the schives for the bekerell, price of the work 2d per lb: 5s 8d" (Hudson and Tingey 1910, 65). He was constable for St Giles ward in 1453 (Hawes 1986, 14) and was still alive in 1457 when he was bequeathed 40s in the will of Katherine Brasyer (Cattermole 1985, 404, citing NCC, Brosyard 58) and his wife, Agnes, died (ibid, citing NCC, 91 Jekkys). In this year he also appears in a muster for St Giles' ward (Hudson and Tingey 1906; 409, 413). On 20 April 1458 he attended a meeting of the Guild of St George at St George's Inn (Grace 1937, 55). His will is dated 1470 (Farrow 1945, 32, citing NCC, 177 Jekkys).

The third bell at St Peter Permountergate, Norwich (4636) was cast in Norwich and is inscribed "Ricus Brasyer Fecit Me". There were two Richard Brasyers, father and son, both of whom were active as founders, and in city politics, in fifteenth-century Norwich.

Richard Brasyer I became a freeman of the city in 1424 when he is described in the free book as "Rics Brasyer Goldsmyth, fil Robti Brasyer Belzet" (L'Estrange and Rye 1888, 20; L'Estrange 1874, 28). In 1430 he was treasurer of Norwich (Hawes 1986, 23), and he had probably taken over at least management of the bellfoundry by his father's death in 1435 as it is not mentioned in the latter's will (Cattermole 1990, 148, citing NCC, Surflete 177). In 1436-7 he was sheriff of Norwich (L'Estrange 1874, 29; Hawes 1986, 23), appearing in a petition against Thomas Wetherby on 18 December 1436 (Hudson and

[17] Fundenhall (4472), Ketteringham (4532), and Trimmingham (4725).

Tingey 1906, 328-9) and attending an assembly on 21 March 1437 (ibid, 281-2). On 7 January 1438 he was elected to go to London to renew the franchise of the city and was part of a delegation to the King at Windsor in 1443 (ibid, 69, 283). The treasurer's roll for 1445-6 records that he was supervisor of the city and received 3d for helping to govern the city in the absence of Sir John Clyfton (ibid, 70), and on 9 October 1448 the patent rolls of 27 Henry VI find Thomas Aillesham of Holkeham, Norfolk appearing "to answer Richard Brasyer, citizen of Norwich, touching a debt of £8 13s 5d" (Anon 1909a, 193). His name appears on a list of braziers compiled in 1450-1 (Deedes and Walters 1909, 48; Cattermole 1990, 151).

Between 1437 and 1474/5 he was alderman for North Conisford or Berstreet wards (Hawes 1986, 23; Grace 1937, 43-9) and in 1456 he was mayor of Norwich for the first time (Hawes 1986, 23) receiving the thanks of the city of Norwich for his diligence the next year (Cattermole 1990, 151; L'Estrange 1874, 29). He was given the power to raise the muster in Conesford ward on 14 October 1457 (Hudson and Tingey 1906, 404-5) and on 7 October 1458 the patent rolls of 36 Henry VI record that he, with others, was commissioned to survey and repair the walls of Norwich (Anon 1910b, 441). He was auditor of Norwich in 1461/2 and mayor for the second time in 1463 (Hawes 1986, 23). The patent rolls of 3 Edward IV record that, as mayor of Norwich, he was commissioned with others to arrest Robert Wolston on 16 July 1463 (Anon 1897c, 302). In 1469 he was involved in a law suit with the men of Mildenhall, Suffolk (Raven 1890, 46-52). He wrote his will in 1475, and it was proven by his son, Richard Brasyer II, in 1482 (L'Estrange 1874, 29, citing NCC, A Caston 122).

This Richard was admitted to the freedom of Norwich, as a Brazier, in 1478. He was the son of Richard Brasyer I by his second wife, Katherine (died 1457) (Cozens-Hardy and Kent 1938, 40), not by his first wife, Agnes (*pace* L'Estrange 1874, 29). In 1479 he was constable of Mancroft and was councillor for that ward between 1481 and 1494 (Hawes 1986, 23). He inherited the foundry by his father's will in 1482, and on 1 November that year he is mentioned in a letter from Margery Paston to John Paston (Gairdner 1896, iii, 293; Raven 1906b, 168). In 1486-8 the churchwardens' accounts for East Dereham, Norfolk record him receiving them, supplying wine, and dealing with the agreements, although the bell itself was cast by John Baly (Cattermole 1990, 152-3). In 1495 he was sheriff of Norwich (L'Estrange 1874, 29) and he was alderman for St Stephen's between 1496 and his death in 1513 (Hawes 1986, 23; Grace 1937, 108). In 1505 he wrote his will

(L'Estrange 1874, 29; Cattermole 1990, 153, citing NCC, Coppynger 81; Cozens-Hardy and Kent 1938, 40) and in 1510 was mayor (Hawes 1986, 23). During his tenure of this post he is recorded as sitting in court five times between August 1510 and April 1511 (Hudson and Tingey 1906, 308-9) and issued an ordinance for the governance of the worsted weavers on 25 November 1511 (Hudson and Tingey 1910, 376-9). He died, childless, and was buried with his father and grandfather[18] in St Stephen's, Norwich on 5 September 1513 (Clouston and Pipe 1980, 18). His will was proven on 7 October 1513 by Sir John Gryme, priest (Cozens-Hardy and Kent 1938, 40).

His will made provision for a memorial in the church which was recorded by Benjamin Mackerell in the early eighteenth century before its destruction (manuscript notes in the church chest at St Stephen's, Norwich; Cattermole 1990, 154; Ellacombe 1874, 29-30; Haines 1861, 146). This was inscribed "Orate pro anima Ricardi Brasyer Senioris Norwici Civitatis olim Aldermanni ac etiam pro anima Ricardi Brasyer filii eius predicte Civitate quondam Aldermanni et Maioris qui ab hac luce mugravit v die mensis Septembris anno domini Mccccxiii" and bore an escutcheon "a coronet between 3 bells". This description fits well with shield 3.0091 which appears on the bell at St Peter Permountergate, but also with the similar ermine shield 3.0093 and its smaller cousin 3.0092. It seems clear that one of these related shields was on the Brasyer monument in St Stephen's, and that all three shields were used by members of the family.

The four bells which bear these shields but also bear independent evidence of the date of casting or founder suggest that these shields may have been used more widely however.

[18] Richard Brasyer I's father, and founder of the dynasty, was Robert Brasyer. He first appears as "Robert Fuller of Stoke Ferry 'Brasier'" when admitted to the freedom of Norwich in 1377 (L'Estrange and Rye 1888, 56). "Robert Fuller, Brasyer" purchased a property in St Stephen's in 1380 and is recorded as "Robert Brasyer" in the next year when purchasing a property in Wastelgate (Cattermole 1990, 146). In 1383 he is described again as "Robert Fuller" in the abuttals of the messuage in St Stephen's (Cattermole 1990, 146), but in 1385 and 1389 he appears as "Robert Fullere alias le Brasyer" when he purchased the vacant piece of ground bounded on all sides by highways in Wastelgate which became the Brasyer foundry site for the next century (Cattermole 1990, 146). Further property transactions, including the enfeoffment of part of a manor at Erlham, are recorded in 1392, 1394, and 1399 (Cattermole 1990, 145; Anon 1909c, 588). From 1390, he appears consistently in the records as "Robert Brasier", appearing in the city accounts for 1390-1 receiving 20s from Nicholas Corpesty (Hudson and Tingey 1910, 50). He also appears in the patent rolls on 26 April 1402 and 15 February 1407 in connection with debts he was owed (Anon 1905a, 78; Anon 1907a, 255). In 1390 he appears, as a bellfounder, in the lawsuit against John de Riston (*ut supra* §2.1.3). He entered public life in 1391-2 as a bailiff of the city, holding this office again in 1398-9 and 1402-3 (L'Estrange 1874, 27-8; Cozens-Hardy and Kent 1938, 17; Hudson and Tingey 1910, 252-4; ; Cattermole 1990, 148; Anon 1905b, 587). He was receiver in 1397-8 (Anon 1909c, 394). In 1403-4 and 1413-14 he was sheriff (Anon 1910c, 176), and in 1410 he was mayor. He was a member of parliament for Norwich in 1413 and 1417 (Hudson and Tingey 1910, 62) and appears as an alderman of the city in 1424 and 1429 (Hudson and Tingey 1906, 109-14; Anon 1909a, 29-32). In 1412 he was responsible for levying the lay subsidy (Anon 1909b, 378-81). He wrote his will on 2 February 1435 in which he is described as a mercer (L'Estrange 1874, 27-8, citing NCC [illegible]).

A bell at Norwich cathedral with 3.0093 (4593) bears an injunction to pray for the soul of Robert Brethenam, a monk of the community who died in 1469 (L'Estrange 1874, 170), and so probably dates to shortly after then whilst the Brasyer foundry was in the hands of Richard I. The bells at Mundham, Norfolk (4573-4) may be attributed to the John Baly who cast the bell at East Dereham (see above §2.2.4.6) on the basis of the ligatured initials, 7.0092. This bears shield 3.0092 and probably dates to the time of Richard II. Another bell at Cratfield, Suffolk (3158) bears an injunction to pray for the soul of William Aleys, who appears in the churchwardens' accounts of the parish until 1498 (Holland 1895; 18-19, 21, 23, 29, 109) and probably died shortly thereafter. Consequently this bell probably also dates to the time of Richard Brasyer II. A bell bearing shield 3.0091 at South Bergh, Norfolk (4682) which seems to date to shortly after 1522 is discussed below (§2.4.4).

Before leaving East Anglia, five bells in Norfolk which bear the name "WILELLMUS DE NORWYCO" must be considered.[19] That at Hellesdon can be dated to between 1362/3 and 1384 on the basis of the donor of the bell whose name is also inscribed on it. John de Hellesden received the advowson of the parish in 1362/3, endowed a perpetual chantry in the church, and was buried there, his brass recording that he died on 19 April 1384 (L'Estrange 1874; 10, 25, 84, 143). This founder cannot be unequivocally identified in the documentary record. L'Estrange (1874, 25) equates him with the "William de Notyngham" who was admitted to the freedom of Norwich in 1376, but as this man was still known as William de Notyngham in his will, proven in 1396, it is unlikely that he would have cast another name on his bells (Cattermole 1990, 145-6). It is not even certain that this founder worked in Norwich itself, although the distribution of his recorded bells would be consistent with a base in that city.

2.1.5 Iohannes de Stafforde

The dangers of assuming from a founder's name the site of his foundry are illustrated by the next two bells which are inscribed with the name "IOHANNES DE STAFFORDE".[20]

John de Stafford was based in Leicester. He first appears in 1338 when he was admitted to the freedom of the city (Hartopp 1927, 37) and appears on the roll of the Gild of Merchants (Bateson 1901, 43-4). On 23 April 1341 "John of Stafford" was paid 50s for

[19] Barford, Bintry, Hellesdon, Melton Parva, and Thurne (4374, 4389, 4509, 4562, and 4720).

his expenses at Parliament with William Brid and for scrutinizing a tally, and on 2 October 1346 he received 18d in rent from Stephen Belzeter of Leicester[21] for land in the northern suburbs (ibid; 47-8, 391). On 13 April 1354 he appears in the tallage roll for Leicester as "Jon de Stafford belleyetere 1s" (Bateson 1901, 96; Tilley and Walters 1910, 14; Garbett 1953, 8). This reference firmly identifies this man as the bellfounder (*pace* Tilley 1878; 1892 who was unaware of this entry). On 20 June 1361 he received 3d in rent for a messuage in the northern suburb (Bateson 1901, 398) and in the same year he lent 20s to John Cook, mayor, later receiving £2 as repayment of loans (ibid; 96, 131-2).

He is recorded as a member of parliament for Leicester on 4 May 1366 (ibid, 461) and was mayor for the first time in 1367/8 (Hartopp 1927, 45). As mayor he witnessed land grants on 16 November 1367 and 19 March 1368 (Bateson 1901, 401). He also witnessed an indenture on 8 March 1369 (ibid). He was mayor again in 1370/1 and 1371/2 (Bateson 1901, 447; Hartopp 1927, 46; North 1876, 39; Benson 1898, 21-2), witnessing a land grant from Alexander Chase, vicar of St Margaret's on 11 April 1370 (Bateson 1901, 402). In 1371 the rolls of York Minster record "Et in una magna compana, per Johannam de Stafford ex convencione operanda £6 13s 4d" (Raine 1859, 9; North 1876, 38; Benson 1898, 21-2; Potter 1987, 8; Swanson 1989, 75). In 1372/3 he was a member of parliament for Leicester again, as "£3 4s to John Stafford and John Peterborough being at the parliament of London for 16 days, viz 4s a day" is recorded in 1372 and he is recorded as a member of parliament again on 12 November 1373 (Bateson 1901; 148, 461). In 1372 "arrears of John of Stafford, late mayor, 9s 41/2d" is recorded in the records of the Corporation of Leicester and on 9 June 1375 he received 3s 4d of rent for a tenement outside the north gate (ibid; 147, 403). On 26 January 1377 he witnessed a grant to Thomas of Melton[22] of a toft lying outside the north gate in St Margaret's parish, and he witnessed another indenture on 11 June 1380 (ibid; 404, 406). He is recorded as a member of parliament again on 5 November 1380, and was mayor for the fourth and final time in 1381/2 (ibid; 447, 461; Hartopp 1927, 49). On 14 August 1382 he dealt with a quitclaim from William Ferour (Bateson 1901, 197-9) and on 29 April 1384 he is

[21] The tenors at All Saints, Leicester (1910) and at Scawby, Lincolnshire (2190).

[21] Stephen le Belleyetere became a member of the merchant gild and a freeman of Leicester in 1328 (Bateson 1901, 4; Hartopp 1927, 33). He was assessed at 25s in the tallage roll for 1336 (Bateson 1901, 36) and he paid 1s for the rent of the chamber beyond the north gate in 1337 (ibid, 27). We find him paying rent to John de Stafford in 1346 and he appears for the final time on 29 December 1348 when he was granted 18d in rent (ibid, 392).

[22] "Tho. de Melton, belmaker" entered the merchant gild and became a freeman of Leicester in 1368 (Bateson 1901, 143; Hartopp 1927, 46). He received part of two tofts lying outside the north gate of Leicester by the grant of 26 January 1377 witnessed by John de Stafford, and granted two tofts outside the north gate to John Bonyfaunt on 15 September 1392 (Bateson 1901; 404, 409).

recorded as a member of parliament for the final time (ibid, 461). He witnessed grants on 6 January 1385 and 9 February 1385, and appears for the last time witnessing a conveyance of 13 June 1392 (ibid; 203-4, 407).

2.1.6 Bells bearing the names of York founders

Moving north, we come to a bell at Dacre, Cumberland (0360) which is inscribed "CAMPANA BEATE MARIA / IOHANNES DE KVRKAM ME FECIT". "John de Kirkham, potter" became a freeman of York in 1348 (Anon 1897a, 41; Benson 1898, 21-2). On 8 February 1358 he witnessed a grant from Robert de Garton to John de Lutrington of a plot of land in the parish of St Sampson (Smith 1990, 86). In 1371 the Fabric Rolls of York Minster record "Et in permutacione facta cum Johanne de Kirkham pro alia magna campana pro le clok ... £20" (Raine 1859, 10; Benson 1898, 21-2; Potter 1987, 10). This is the last certain mention of the founder, although two quitclaims, dated 8 October 1394 and 25 January 1395 mention "the land which John de Kyrkeham once held" (Tringham 1993, 52-3; Percy 1973, 28). It is not clear whether he was dead by this date, or whether he had simply disposed of the property. He was certainly dead by 7 October 1426 when his wife, Johanna, is described as "relicta Johannis Kirkham, civis et potter" (Skaife 1872, 244; Collins 1889, 98).

Three bells are inscribed with the name of John Potter.[23] John, son of Nicholas the potter, was made a freeman of York in 1359 (Benson 1898, 23; Poppleton 1905, 96; Greenwood 1995, 162; Page 1912, 449). He apparently appears again in 1380 (Walters 1912, 379; Page 1912, 449), although this reference is unsubstantiated.

The treble at Catwick, Yorkshire (East Riding (4021)) bears the name of Thomas Dekun. He became a freeman of York in 1370 and appears in the ordinances of the Potters' Guild between 1385 and 1407 (Dawson 1998, 136).

Next we come to eight or so bells in Yorkshire which bear the inscription "THOMAS DE WALD ME FECIT".[24] This man is recorded on 12 November 1372 when "Joan de Suardby contra Thomas del Walde of York, potter" sued for breach of promise (Helmholz

[23] West Halton, Lincolnshire; Holy Trinity, Micklegate, York, and Barmby-Moor, Yorkshire (East Riding) (2280, 4113, and 4003).
[24] Bielby, East Cottingwith, Elvington, Howden, Millington, and West Heslerton in the East Riding (4012, 4026-7, 4030, 4050, 4063, and 4097), Brotton Parva in the North Riding (4257), with other unconfirmed examples of this type at Farlington and Great Ayton in the North Riding (4279 and 4283).

1974; 96, 208-12; Smith 1988, 44). Two further bells may be attributed to the York foundry on the basis of this document because they are inscribed with the name "IHONES VALD" (Everingham and Westow in the East Riding (4032 and 4098)). He has yet to be located in the archives.[25]

2.1.7 Bells bearing the names of other provincial founders

Before returning to London to deal with bells cast in a later period, there are a few more provincial founders to be mentioned. A bell at Westmill, Hertfordshire (1641) is inscribed "WILLELMUS ROFFORDE ME FECIT". This founder is documented in 1398 at Toddington, Bedfordshire (see above p44) and is also recorded in 1390 when the patent rolls of 14 Richard II record a license for Thomas Bullock to grant an estate to his daughter and her husband Thomas Rufford, son of "William Rufford de Tudyngton, belmaker" (Anon 1902a, 305; Tilley and Walter 1910, 8).

Finally, a bell at Chitterne, Wiltshire (3779) bears the name of John Barber. In 1396-7 he contributed £3 6s 8d for a royal aid subsidy in Salisbury (Tyssen 1908, 369). He wrote his will in that town on 1 February 1404 and it was proven on the 14 May (Raven 1906c, 98-9; 150, 288; Walters 1906a, 188; Tyssen 1908, 356-7).

2.1.8 Bells bearing the names of sixteenth-century London founders

Returning to London we find two French men casting bells in the years before the Reformation. A bell formerly in the chapel at Sutton House, Surrey (3491), but now in a catholic church in Woking, bears the inscription "LD 1530 Pierre Baude ma faiecte". Peter Bawde was a French gunfounder, first recorded in 1528 when he was paid £20 "for the making of brass ordnance at Houndesdiche" (Gairdner 1880, 306) and appears as a "Franche man" in the accounts of the Founder's Company (Parsloe 1964, 77; Stahlschmidt 1886, 172). In October 1529 he was working at the Tower of London as a gunfounder (Brewer 1876, 2687), and on 3 March 1533 he was described as a "French gunfounder" (Gairdner 1882, 454-5; Tyssen 1915, 54). He was paid for casting brass guns in 1538 (Gairdner 1893; 525, 527, 531). He was still active beyond the Reformation as he appears in the 1541 lay subsidy: twice, as a stranger in St Botolph without Aldgate assessed on the basis of the £20 per annum fees that he received from the Crown, and

[25] These men may have been related to the Adam del Wald "irenmanger" who appears in the Freemen's

again as a stranger in St Gabriel Fenchurch assessed on the basis of 20s goods (Lang 1993, 93 and 97; *pace* Tyssen 1915, 55). By 1543 he had moved to Buxted, Sussex, where he cast the first cast iron cannon recorded in Britain (Hadley 1976, 24). He died in 1546 (Kennard 1986, 39).

Seventeen bells are inscribed "Iohannes Tonne me fecit".[26] Two of these bells bear their dates of casting in Roman numerals within their inscriptions—the tenor at Botolphs, Sussex was cast in 1536, the bell at Stanstead Mountfichet in 1540. John Tonne witnessed the will of William Culverden which was written on 19 September 1522 (see below §2.2.3) and appears in the churchwardens' accounts of Great Hallingbury, Essex in 1542 when he paid £3 7s for bell metal (Raven 1882, 44-6). This bell which bears both his name and the date of casting survives and demonstrates that he certainly continued casting after the Reformation. He may have worked as an itinerant founder, firstly in Sussex and the surrounding counties and later in southern East Anglia as there are bells bearing dates, but not his name, of 1511 (Downe, Kent (1696)) and 1529 (Sullington, Sussex (3608)) and the distribution of his recorded bells falls clearly into two groups (Fig 24).

2.1.9 Bells bearing the names of foreign founders

Three bells can be attributed to foreign founders, although they were all probably imported.

The bell at Baschurch, Shropshire (2649), is Flemish, cast by Ian van Venloe in 1447 (Walters 1915, 237-9). It is one of a small number of bells in England probably by this founder (cf Whitton, Suffolk, and Yowchurch, Herefordshire (3450 and 1574)).

The bell at Bromeswell, Suffolk, bears the name of Cornelis Waghavens and the date 1530 (3130). This founder worked in Mechlin and this is his only known bell in England (Clouston and Pipe 1980, 31).

Register of York in 1370 (Finlayson 2004, 957).

[26] West Wratting, Cambridgeshire (0280), Aythorpe Roothing, Belchamp Otten, Hempstead, Little Easton, Littlebury, and Stanstead Mountfichet, Essex (0969, 0974-5, 1046, 1079, 1076, 1126), Little Wrattling, Suffolk (3298), and Botolphs, Findon, Lewes Market Tower, Rotherfield, and Twineham, Sussex (3517-9, 3553, 3576, 3597, 3611-12).

A bell formerly at Church Kirk, Lancashire (and now in Whalley church (1812)) is by Peter van den Ghein and is dated 1537. This founder was active in the second quarter of the sixteenth century and he is also represented in England slightly later with bells dated 1548 at Peterhouse College, Cambridge (Cheetham 1916; 23, 62, 72-5), and 1565 at Rye, Sussex (Hills 1934, 215-18).

2.1.10 Dated bells bearing the names of unknown founders

This concludes the evidence of bells which bear the name of founders who can be identified in the documentary record. There are, however, a few more founders who, although they have not yet been discovered in manuscript sources, have left their names on bells which can be dated from their inscriptions.

One such is John de Colsale who cast his name on bells at Beckingham, Nottinghamshire and Milwich, Staffordshire both dated in Roman numerals to 1409 (2445 and 3064).

The name of Robert Hendley appears on a bell at St Nicholas, Gloucester (1220) which was cast in the time of "CLEMENTIS LICHFILD SACRISTA". Clement Lichfield was sacrist of Gloucester Cathedral before holding several minor offices at Evesham Abbey and becoming Abbot thereof in 1514. Thus this bell probably dates from the last quarter of the fifteenth century (Bliss and Sharpe 1986, 343-7).

From its inscription we learn that a bell at Greystoke, Cumberland (0376) was cast by John Torner after the death of Thomas Dacre on 24 October 1525 (Whitehead 1891a, 134-51).

A bell at Cold Ashby, Northamptonshire (2331) is dated 1317 and bears two seals, one is illegible (3.0026), but the other belonged to William de Flint (3.0027). It is not certain whether this man is the founder of the bell.

2.1.11 Bells bearing the names of unknown founders

Sixteen founders left their names on bells but have not been identified in manuscript sources. None of these bells can be dated independently of the typological characteristics of the bells themselves or their lettering.

Four disparate bells bear the name of John Sleyt in various forms.[27] Four more have been recorded with the name "IOHANNES DE YORKE".[28] Despite his name this founder almost certainly did not work in York, but according to the distribution of his surviving bells somewhere further south (Fig 24). Robert Merston left his seal (3.0032) on five bells in east Lincolnshire,[29] and Austen Bracker cast his name on bells at Harston and Newton, Cambridgeshire (0247 and 0265). There is a bell with the same cross and lettering at Islington, Norfolk dated 1556, although this does not bear Austen's name. Two, apparently related, founders named Stephen and John Frankys have left bells in the East Riding of Yorkshire.[30]

Otherwise there are single bells by John Aleyn at Southease, Sussex (3602), Walter Blower at Spixworth, Norfolk (4689), Walter Caldrner at Scrayingham, Yorkshire (North Riding)(4326), William Duddley at Well, Lincolnshire (2270), Geoffrey de Edelmeton, formerly at Billericay, Essex (0978), Thomas Hey at Wraxhall, Dorset (0911), Robert Plummer at Wolterton, Norfolk (4755), and by William Warwick at Hereford Cathedral (1506). A bell at Bramber, Sussex (3520) bears the name "NICOLAS" and one at Scawton, Yorkshire (4324) bears the name "IOHANNES DE COPGRAVE" on a foundry shield (3.0099). It is possible that John may have worked from York, as a William de Copgrave became a freeman of York at the end of the thirteenth century and it is an unusual surname (Anon 1897a; 5, 9; Hutton 1984, 2). Finally, it is unclear whether "RICHARD PETTE" whose name appears on a bell at Kirkby Fleetham, Yorkshire (North Riding)(4293/4) was the founder or the donor of the bell.

2.1.12 Dated bells

The final group of bells where evidence of date or manufacture is unequivocal are those where the founder is unknown, but the date of casting is inscribed on the bell. These bells are listed in Table 2. The earliest, dated 1254, is that at Lissett, Yorkshire (East Riding)(4058). In common with other bells of thirteenth- or fourteenth-century date, the date is cast in Roman numerals, as words in Latin, or in a mixture thereof. Arabic

[27] Glapthorne, Northamptonshire, Owston, Leicestershire, North Elkington, Lincolnshire, and Levisham, Yorkshire (North Riding)(2346, 1919, 2151, and 4301).
[28] St Mary the Great, Cambridge, Clapton and Great Billing, Northamptonshire, and Sproxton, Leicestershire (0222, 2329, 2350, 1934).
[29] Little Steeping (2128), North Cockerington (2150), Skendleby (2202), and Trusthorpe (2258-9).
[30] Elstronwick and Tunstall (4029 and 4092).

numerals first make their appearance at the very end of the fifteenth century on a bell in the gatehouse at Durham Castle (0924; dated 1495). Although the bell at St Chad, Lichfield may be earlier, the reading of the date is not unequivocal (3062; Lynam 1889; vi-vii, 19, 76; Jennings 1970; 18, 22, 39; *Ringing World* **XXIII**, 438 (13 July 1928)).

2.2 Devices and documents

The next category of evidence which ties certain bells or stamps to identifiable founders or foundries is provided by the devices which were used, particularly during the fifteenth century when placing the founder's name on bells went out of fashion. Some of these marks can be assigned to particular places of manufacture or to specific bellfounders using a variety of evidence which is, in general, less definitive than where names or dates appear in full in the inscription. It is therefore even more important to examine the attribution of these stamps rigorously. In this study it is essential that attributions are both secure and independent of the incidence matrix of stamps and the bells on which they occur, because this evidence will be used as a standard to compare the results of different mathematical approaches to the analysis of the incidence matrix. It is therefore of paramount importance that the standard is accurate.

For this reason, only the following criteria are accepted for assigning marks to founders or foundries:

- where a shield is the heraldic device of a place or family
- where a stamp can be dated on the basis of its content
- where a shield bears the name of a founder who appears in the documentary record
- where a shield is a rebus or a cryptogram of the name of a founder who appears in the documentary record
- where a shield bears the initials of a founder who appears in the documentary record, the spatial distribution of surviving bells being used as supporting evidence to decide between different possibilities in cases where more than one shield and or documented founder has the same initials.

It should be noted that the spatial distribution of surviving bells with a particular mark has not been used *on its own* as a criterion for assigning a mark to a particular foundry, nor have single initials been considered sufficient evidence for a secure attribution. There are

some attributions of shields to particular founders made on these grounds which are almost certainly correct, although evidence of the other stamps used on the bells with the foundry shield has usually also been taken into account. Therefore these attributions cannot be considered independent of the evidence of the incidence matrix and are not included here. A few complex cases where different strands of evidence combine to suggest a particular date or attribution for bells or devices are considered below (§2.4).

2.2.1 Dated marks

Shield 3.0005 and its crowned variant, 3.0006, are the royal arms and must date to after 1413 when Henry V quartered them (Tyssen 1915, 37). Stamp 7.0020 is formed from a groat which was first struck in 1351 (Tyssen 1915, 55).

2.2.2 Devices of places

A few marks which are the heraldic arms of towns which housed foundries can be identified. Stamp 3.0094 is the arms of the city of Norwich; stamps 7.0074–7.0077 are variants of a ship and may refer to the badge of Bristol; shields 3.0089 and 3.0090 incorporate elements of the arms of the Abbey of Bury St Edmunds; and badge 3.0019 have been variously identified as the arms of the Episcopal See of Winchester (Cocks 1897, 68) or those of Chertsey Abbey (Tyssen 1915, 65-6)[31]. These marks can therefore be assigned to foundries based in these towns, with varying degrees of confidence.

2.2.3 Rebus devices

Other stamps can be assigned to specific bellfounders who are known to have worked in particular towns. Shield 3.0015 introduces the concept of a rebus device. It bears a bell upon which is the word "fond" (founder) and around which are the opening words of Psalm xi "In dno confido" (Raven 1890, 38-9). Beneath this is a "W" and a small bird above which are the letters "de" surmounted by an abbreviation mark. The bird has been identified as a pigeon (ME. culver) and so the stamp as "W. Culverde[n]" (Deedes and Walters 1909, 42). In 1497, when Adam Oxenbrege was mayor, the town of Rye, Sussex,

[31] In fact a similar design, incorporating references to SS Peter and Paul, is associated with other religious houses (including Bath Priory and Plympton Priory). In fact, it is not clear that Chertsey ever formally adopted St Paul in addition to St Peter as it's patron, and so perhaps this attribution is also tenuous (Keene pers comm 2006).

purchased a "wagge" bell from William Culendon, citizen and bellfounder of London, for 47s 4d (Vidler 1934, 45; Elphick 1970, 377). This is probably the existing uninscribed old watch bell (3598). He appears again in November 1510, when he was sued for defamation by William Smith (Brodie 1920, I(i) 351-2; Tyssen 1864, 15; Cocks 1897, 44-5), in 1510/11, when the churchwardens' accounts of St Mary-at-Hill, London, record "Paid to Coulverton, Belfownder for metal for the grete bell .. lix s vj d" (Littlehales 1905, 275), and on 29 September 1522, when he wrote his will (Raven 1882, 44-6, citing PCC, 8 Bodefelde). This was proven on 2 June 1523 and demonstrates that he lived in the parish of St Botolph, Aldgate, and leased his premises from the priory of the Holy Trinity there. The trefoil on the shield appears to denote this connection. Shield 3.0015 appears on 28 bells (Appendix 3).

Stamps 3.0022 and 3.0017 can be assigned to Thomas Lawrence, the man who had purchased the lease on Culverden's premises and "all the implements belonging to the craft of a bellfounder" for £120 before the latter wrote his will. 3.0022 represents the grid iron upon which St Lawrence was roasted and 3.0017 may be a rebus of "Thomas Lawrence". These marks occur on six bells (Appendix 3).

Lawrence was an active founder in London throughout the 1520s and 1530s. The will of William Culverden, which Lawrence witnessed, mentions that he had purchased the foundry shortly before 1522. He became a freeman of the Founders' Company in 1523, was admitted to the livery in 1525, became a member of the court of the Company in 1527, was under warden in 1529, and upper warden in 1536 (Parsloe 1964, 64-85; Stahlschmidt 1887, 52; Hadley 1976, 161). In 1525 Cardinal College, Oxford received £13 6s 8d from Thomas Lawrence for bells sold to him at Begham (Deedes and Walters 1909, 44). On 6 June 1528 he entered a bond with Nicholas, the prior of Holy Trinity, Aldgate for 20 marks (Anon 1902c, 25; Walters 1926a, 299) and on 8 August 1528 he entered a bond for £16 10s with Thomas Crumwell (Brewer 1876, 2344; Cocks 1897, 45). In 1535 the lay subsidy rolls for Portsoken ward assess 'Thomas Lawranns' at 10s on a value of £20 (Stahlschmidt 1887, 52) and in 1538-9 the (lost) churchwardens' accounts of Thame, Oxfordshire recorded "Itm pd for makyng of ij Bylles Intented betwene the pishe & lawrence belfounder of london...vijd" and "Itm Rec of Thomas lawrence of london belfounder and of his suerties...viijli" (Cocks 1897, 45-6). Between 1539 and 23 March 1541, when he was admitted to the freedom of the city (L'Estrange and Rye 1888, 85), Lawrence appears to have retired to Norwich. He was buried there in St Stephen's church

on 23 December 1545 (L'Estrange 1874, 34). There is no evidence that Thomas continued bellfounding from his new home.

Stamp 3.0014 carries the inscription "William ffoundor me fecit" and occurs on a total of 38 bells (Appendix 3). William was a London founder at the turn of the fourteenth century, although there are two men in the London records of this period who are described as "William Founder" and it is not always possible to distinguish them.

Following Stahlschmidt (1887, 25), William Dawe has generally been allocated this mark. "William Dawe Foundr" appears in a deed of 1393 belonging to the Cornwallis family relating to some property in the East End, and in 1395 in a deed relating to the same premises and witnessed by the same four men he is described as "William Foundor". Unfortunately these deeds cannot now be traced, although, along with the birds on stamp 3.0014 which have been identified as jack*daws*, William Dawe is still probably the most likely candidate for the mark. He may be the man who paid 9s 3d rent to Holy Trinity Priory for a tenement in Portsoken ward in 1392 (McHardy 1977, 76). Stahlschmidt (1887, xiii) argued that William Dawe used the name "William Founder" because there was a contemporary Londoner of the same name who was a white tawyer, however this man may belong to the previous generation appearing in 1371, 1375/6, and 1385 (Sharpe 1907, 16, 25, 132, 274; Stahlschmidt 1887, xiii).

On 29 March 1386 William Wodeward supplied 60 cannon to the King for £10 (Devon 1837, 229; Salzman 1923, 151; Tyssen 1915, 18), on 6 May 1407 he appeared in a dispute in the London Possessory Assizes relating to a messuage in the parish of St Olave by the Tower (Chew 1965, 96-8), and on 3 November 1411 "Wm Wodeward founder" was assessed at £2 19s 4d for the lay subsidy of 1412 (Boyd 1928, 21). On 5 June 1416 "William Wodeward founder" was paid £40 "for the purchase and providing of cannon and powder for the cannon" (Devon 1837, 346; Cocks 1897, 30). Overall he cast at least 73 guns for Richard II. He died in 1421 (Kennard 1986, 156).

This connection with gun-founding perhaps makes it more likely that William Wodeward is the "William the founder, of London" who cast guns for Dover Castle on 1 May 1385 (Devon 1837, 227; *pace* Stahlschmidt 1884, 45-6), and he is also the more likely recipient of a grant for life recorded on 13 December 1414 in the patent rolls of 2 Henry V of a livery yearly at Christmas "to the king's servant William Foundour, esquire, for his good

service to the king's father and the king" (Anon 1910c, 270). It is more difficult to identify the "Master William Foundour" who cast four new bells for St Pauls Cathedral in 1405, although this is likely to have been the owner of badge 3.0014 (Harvey 1974, 91). Equally "John Walgraue seruaunt of Wyllyam Fondour" who appears in the will of John Plot which was proven in 1408 may have been employed by either man (Furnivall 1882, 15) and either man could have witnessed the deed of 1418 which was enrolled in the Hustings Court (Stahlschmidt 1887, 25). Finally, on 21 September 1420 "William Founder" is recorded as released on bail, having been committed for aiding and abetting a group of citizens who refused to contribute to the subsidy of 2000 marks granted to the King (Sharpe 1909, 245-6). Although this information must cast doubt on the attribution of stamp 3.0014 to each of these men, it is still very likely that it belonged to one of them. Consequently, despite these uncertainties, the mark certainly dates to the turn of the fourteenth century and hails from London.

This discussion illustrates that the interpretation of makers' marks is not always straightforward. This is further exemplified by stamps 3.0001 and 3.0002. Here, following Tyssen (1915, 31), 3.0001 is attributed to William Chamberlyn, being a development of the arms of Chamberlain (gules, two keys in saltire, or; Parker 1894, 343) with a laver-pot and bell denoting the founder's craft.[32] Stamp 3.0002 seems to be a rebus of his first name "William".[33] An alternative attribution of these shields to another London founder, Henry Jordan, has also been proposed on heraldic evidence (Stahlschmidt 1884, 57; Deedes and Walters 1909, 36; Tyssen 1891, 86), although this is rather unsatisfactory on both iconographic grounds and from the lines of descent of the London foundries (Bayliss 1987 and see below Chapters 3 and 4).

William Chamberlyn was another London founder. He and his wife, Isabella, are mentioned in the will of Richard Hille (Stahlschmidt 1884, 49-51, citing GL, MS 9171/4, f. 44v), which was written and proven in May 1440. He was an executor for the will of Hille's wife, Johanna, which was written 3 February 1441 and proven on 30 May (Barron 1994, 104, citing GL, MS 9171/4, ff. 62v-63). He entered into a bond for the inheritance of the children of William Blakman, tailor on 22 July 1466 (Sharpe 1912, 65-6) and appears in the close rolls of 8 Edward IV as a beneficiary of the gift of Richard Whyte on

[32] More recent evidence suggests that the various Chamberlain families used a wide variety of heraldic symbols, although when they used keys it always seems to have been as a group of three. The single cross keys on shield 3.0001 may simply be an allusion to St Peter (Keene pers comm 2006).
[33] "WIM" being formed by the vertical element on the shield, and "LLA" by alternative readings of the horizontal element.

25 June 1468 (Anon 1953, 21). He was also executor of the will of Henry Jordan which was written on 15 October 1468 and proven on 11 November 1470 (Sharpe 1890, 543-4; Stahlschmidt 1884, 60-70). On 27 November 1473 Ralph Wolseley appears in the patent rolls of 13 Edward IV for not appearing to answer a debt of £9 9s 4d and "to answer a plea that he render £14 6s 8d to John Bernewell and William Chamberleyn, executors of the will of Henry Jordan" (Anon 1900a, 383). He died in 1474 (; Barron 1994, 111, citing GL, MS 9171/6, f. 180).

The only bell bearing 3.0001 and 3.0002 which is dated independently is at Saxton, Yorkshire (West Riding)(4205). It was donated by William de Sallay, lord of the manor of Saxton, who died in 1492 (Poppleton 1903a, 3). This is consistent with the attribution of these stamps to William Chamberlyn.

Shield 3.0007 can be assigned to a foundry on heraldic evidence with rather less confidence. 3.0007 are the arms of Keble, and the churchwardens' accounts of St Stephen, Walbrook, record that £5 6s 8d was paid to "John Kebyll, wheelwright", for bellhanging in 1480 (Stahlschmidt 1887, 57). Bellhanging is not bellfounding, but on this tentative evidence 3.0007 is attributed to a London foundry. Circumstantial evidence to support this attribution may be provided by a bell at Little Linford, Buckinghamshire (0157) which was donated by John Willoughby. A man of this name was knighted by Edward IV in 1471, although his father shared the same name and so this bell could date to earlier in the fifteenth century (Cocks 1897, 443-5).

2.2.4 Stamps bearing initials

From this rather shaky ground, the attribution of stamps to foundries via individual makers whose initials appear on their foundry shields must now be considered. Inevitably, initials do not provide unequivocal attributions as when a name is given in full. The spatial distribution of surviving bells bearing particular shields or sets of initials can, however, be used in support of attributions, particularly as there is usually a limited number of contenders.

2.2.4.1 'TB'

The first stamps containing initials which must be considered are 3.0011, 3.0012, 3.0042, and 3.0078, all of which bear the initials "TB". Two founders with these initials are known from the documentary record, both working in the early sixteenth century.

Thomas Bett was admitted to the freedom of Leicester in 1521 (Hartopp 1927, 65). He was auditor for the south quarter in 1526/7 and 1533/4 and for the north quarter in 1524/5, 1535/6, and 1538/9 (Bateson 1905, 470-2). He was steward of the fair in Leicester in 1525/6, 1527/8, and 1530/1, and coroner in 1524/5 and 1525/6 (ibid, 465-6). The culmination of his civic career came in 1529/30 when he was mayor, described as "Bellfounder of All Saints" (Bateson 1905, 458; L'Estrange 1874, 74). His will, which was written on 19 December 1538 and proven in London on 6 February 1539, demonstrates that he had married Margery, widow of William Millers and Thomas Newcombe I both of whom were bellfounders (North 1876, 45-6, citing PCC, 25 Dingley).

Bullisden was a London founder. His name occurs in the churchwardens' accounts for St Mary-at-Hill, London in 1509/10 and 1510/11 (Littlehales 1905; 270, 275). In an inventory of goods for Rotherfield church, Sussex in 1509 appears an entry for "a white vestment of Sarsenet with a cros of red damaske fo the gift of Master bullysdon brasier of london" (Goodwyn 1898, 29; Tyssen 1915, 43) and the gift of another "vestment of white basteon, the gift of Mr Belisden" appears in an inventory of St Botolph, Aldgate dated 21 May 1549 (Walters 1939b, 211). It should be noted that in no case is the Christian name of Bullisden mentioned, and so the attribution of bells with a "TB" shield to him would not be possible without additional supporting evidence. A bell at Weeley, Essex (1147) bears the inscription "Sancte Edwarde Ora Pro Nobis / Pray for Vyllam Brooke and Agnes His Wyff" and bears shield 3.0012. Agnes Brooke's will is dated 1509, in which year she also died, so this bell can be dated to shortly before this date (Raven 1882, 42). Another bell with shield 3.0012, at Rayleigh, Essex (1113), is inscribed "Jhus" on the shoulder. This may stand for "Jhesus" or for the arabic numerals "1508" (Deedes and Walters 1909, 40). If this is so, these bells are around the right date for Bullisden, perhaps extending his career a year earlier. Furthermore, a Thomas Bullisden of the parish of St Botolph's, Aldgate, wrote his will in 1513 (not seen, GL MS, 9171/3, f. 100v).

Further evidence to decide which stamp belongs to which of these founders can be determined from Figure 25, which shows that stamps 3.0011 and 3.0012[34] have a more widespread and southerly distribution and 3.0042 and 3.0078 one centred in the east Midlands.

2.2.4.2 'rn' and 'it'

Mark 3.0031 bears the initials "rn". Two founders with these initials appear in the documentary records.

On 20 September 1423 "Robert Norton, bellmaker" was admitted to the freedom of Exeter for a fine of £1 (Rowe and Jackson 1973, 44). He appears again in 1432 when a petition of the parishoners of Plymtree, Devon against "Robert Norton of Exeter, Bellemaker" is recorded in the Chancery Proceedings (Aldridge 1914, 80-1) and twice in 1433, once on 25 May when the patent rolls of 11 Henry VI record that he did not appear, as an executor of Robert Hore, to answer a debt of £17 or for himself to answer a debt of £16 to London merchants (Anon 1907b, 237), and again on 15 November when he did not appear to answer William Olyver for the debt of £17, again as an executor of Robert Hore (ibid, 308). He is said to have continued in business until the late 1460s or 1470s (Blaylock 1996, 73).

Robert Newcombe, son of Thomas Newcombe I, is first mentioned in the latter's will in 1520. He became a freeman of Leicester in 1536 (Hartopp 1927, 68) and succeeded to the bellfounding business of Thomas Bett on the latter's death in 1538. He married Bett's daughter, Katherine (Hartopp 1936, 63). He was chamberlain in 1539/40, auditor for the north quarter in 1541/2 and 1544/5, steward of the fair in 1542/3, 1544/5, and 1553/4, bailiff in 1548/9, and mayor in 1550/1 (Bateson 1905, 47, 66-7, 458-9, 463, 467, 472; Hartopp 1927, 72; Hartopp 1936, 62). On 12 June 1540 he witnessed a grant as chamberlain (Bateson 1905, 47). In 1547 he is recorded as purchasing scrap metal from churches in the city (North 1884, 26) and on 6 August 1548 he was a churchwarden of All Hallows, Leicester when the parish contributed to the levy of horse soldiers for the Scottish War (Bateson 1905, 55). In 1548-9 he paid 40s rent to the borough of Leicester (ibid, 57). He wrote his will on 24 October 1556 which was proven in London on 11

[34] It should be noted that a bell at St Mary's, Bedford (0001), is recorded with 3.0012 and 3.0017. Since 3.0017 is the shield of Thomas Lawrence, a later founder, 3.0012 must have continued in use at least sporadically after Bullisden's death.

August 1557 (Hartopp 1936, 63, citing PCC, 27 Wrastley). His effects totaled £261 16s 8d and the account of one of his executors, Richard Pratte, was committed to the mayor's roll in April 1561 (Bateson 1905, 96-9).

In this case a glance at Figure 26, which shows the distribution of surviving bells bearing 3.0031, is sufficient to demonstrate that this stamp must have belonged to Robert Norton of Exeter.

Stamp 3.0030[35] may also be attributed to the Exeter foundry because of the similarity of its design to 3.0031, even though no founder with the initials "it" has yet been found in the Exeter archives. The two founders currently known from documentary sources with these initials can both be excluded from consideration by viewing the distribution of surviving bells bearing 3.0030 (Fig 26). John Tenand appears in documents in York between 1508 and 1516 (Walters 1912, 382) and bells by John Tonne can be easily identified as he frequently inscribed his name on them (see above §2.1.8).

2.2.4.3 The Heathcote family

The next group of stamps, 3.0025, 3.0028, 3.0036, 3.0065, and 3.0101 can be ascribed to members of the Heathcote family who worked in Chesterfield in the early sixteenth century. 3.0025 and 3.0065 contain the initials "RH" and 3.0036 the initials "GH". Three founders are known from documents who had the initials "RH" and only one with the initials "GH".

Ralph Heathcote of Chesterfield first appears in 1483 when he surrendered a house in Saltergate to John Tomson of Chesterfield and Elene, his wife. "Rawfe Hethcot my son" was appointed an executor of John Tomson's will on 7 October 1492 and so it appears that his wife, Elizabeth, was the daughter of John Tomson. In 1500/1 he is described as "Ralph Heathcote, of Chesterfield in co. Derby, Brasier" in a letter of attorney of Thomas Calcroft and in 1502 "Ralf de Hethcote, de ead Potter" witnessed a deed between Richard Ash and Jos Bereford (Yeatman 1884, 142). In his will, also dated 1502, he left his foundry to his son William (Jewitt 1873c; 141, 144-5).

[35] Another bell at Burstock, Dorset (0758) which is recorded with the initials "it" (Raven 1906a, 57), but where the foundry mark has not been recorded, was probably also by this founder.

A second Ralph Heathcote of Chesterfield is first mentioned in 1510 (Walters 1912, 374). He released lands and houses in Tapton and Chesterfield to his son, George, in 1524 and an inventory of his goods was made after his death on 23 March 1525 (Jewitt 1873e, 141-2).

Stamps 3.0025 and 3.0065 may be attributed to these Ralphs, as the only other founder with the initials "RH" known from documentary sources, Richard Hille, can be assigned another stamp (see below §2.2.4.7). This is corroborated by a bequest from Nicholas Worthy of South Kirkby, whose will is dated 25 December 1492, who gave "Ad fabricationem campanarum eccl. par de Hoton Panell xx s" (Poppleton 1903a, 29-30). One of the bells at Hooton Pagnell bears stamp 3.0025 (4172).

Shield 3.0036 belonged to Ralph II's son, George. In 1540 George Heathcote recast the third at Ripon Cathedral for £8 (Poppleton 1903b, 225-8). Unfortunately, although the inscription on this bell was recorded in 1733, the marks were not illustrated before it was recast by the Whitechapel bellfoundry in 1761, and so we do not know whether it bore stamp 3.0036. He may be the "Georgius Hethcote, bellfounder" who became a freeman of York in 1544, although this could have been an uncle of the same name (Greenwood 1995, 165). In 1545 Thomas Ash, chaplain, granted release to George Hethcote, Alderman of Chesterfield, and his successors from all actions (Yeatman 1884, 144) and on 21 August 1550 he was owed 42 4d in the inventory of Richard Mouldyng (Bestall and Fowkes 1977, 36-7). In 1558 he proved the will of his godfather and uncle, Sir William Heathcott, priest (ibid, 88). George undoubtedly worked from Chesterfield, since, when he wrote his will on 4 August 1558, he bequeathed his dwelling in Saltergate-head, Chesterfield, to his wife Margaret and all his moulds, bell metal, etc to his son, Ralph III (North 1882, 82; Poppleton 1905, 93-4).

3.0028 which contains the initials "GR" and its variant, 3.0101, which contains the initials "GRH" may be attributed to Ralph II and George in partnership in the years shortly before 1525.

2.2.4.4 'RL'

Stamps 3.0018 and 3.0021 bear the initials "RL". Only one bellfounder with these initials has been discovered in the documentary record, Roger Landen of Wokingham, who was

supplying metal chimney pots to Eton College on 22 March 1448 (Raven 1906b, 155, quoting the accounts of Eton College). On 25 December 1453 the close rolls of 31 Henry VI record "Roger Landen of Wokyngham co Berkshire 'belyeter'" gifting all his goods, chattels, and debts to various including John Michell and his sons William and John Landen (Anon 1941, 419). His financial difficulties appear to have continued because on 9 July 1459 "Roger Landen alias Launden of Wokyngham, co Berks 'bellemaker' alias 'belmaker'" appears in the patent rolls of 37 Henry VI for not appearing regarding debts of 50 marks and £10 to Thomas Fulbourne and Robert Drope (Anon 1910b, 453). The attribution of stamp 3.0018 to this founder is confirmed by the "W" below the bell on the shield, which may well stand for "Wokingham", the location of his foundry and by the distribution of surviving bells bearing these marks (Fig 27).

2.2.4.5 'RC'

Shields 3.0004 and 3.0044 are distinct marks, but similar in design. Both belonged to founders with the initials "rc". Three bellfounders with these initials are known from documentary sources.

Richard Chamberlyn inherited William Chamberlyn's foundry in London on the latter's death in 1474 (Barron 1994, 111, citing GL, MS 9171/6, f. 180). He died in 1510 (Barron 1994, 111, citing PCC, 37 Bennett). He may be connected with the "Robert Chamberlyn" who appears in the records of the Founders' Company between 1497 and 1502 (Parsloe 1964; 1, 3, 8, 11, 13, 16; Hibbert 1925, 292).

Robert Clerke was working in Lincoln in the last quarter of the fifteenth century. He first appears as witness to a charter in 1483 (Ketteringham 1987, 34). He was sheriff in 1484-5 and mayor in 1497-8 (ibid). In 1502 "Robert Clerke, citizen of Lincoln, bellfounder" is mentioned in connection with a lease in St Swithun's parish (ibid).

The third founder, Reignold Chirche of Bury St Edmunds, was also working at the end of the fifteenth century. He first appears on 5 April 1471 when he witnessed the will of John Cheney and was an active founder in Smith's Row (SRO B Hawlee f. 137v; Badham and Blatchly 1988, 296-7; Campbell 1998, 73). On 3 October 1475 he was an executor of the will of John Quey (SRO B Hawlee f. 211v) and on 8 October 1492 he was left a share of two tenements in "Chyrchegatestrete" in the will of Margarete Odeham (SRO B Pye, f.8;

Tymms 1850, 73-81). In 1489 he cast five bells for the church of St Michael, Bishops Stortford although the churchwardens' accounts show that he was still being paid for this work in 1495 and 1496 (Glasscock 1882, 21-3). He wrote his will on 16 February 1498 and it was proven on 24 February (SRO/B Pye, f.74v; Raven 1890, 71).

At this point, it would be wise to mention two other men with the initials "RC" who have been put forward as bellfounders from the London records. Richard Creswell is named as an apprentice of Richard Hille in his will (Stahlschmidt 1884, 49-51), although there is no evidence that he ever cast bells on his own account, and in 1439 Robert Crowch was a legatee in the will of William Powdrell, citizen and bellmaker[36] (Stahlschmidt 1887, 32, citing GL MS, 9171/4, f. 32), although there is no evidence that he was a founder at all.

Figure 28 appears to demonstrate that 3.0004 belonged to Richard Chamberlyn, the London founder, although a bequest by John Walsingham, alias Purley, in 1517 for Ryarsh, Kent "to the chaungyng of the grete bell there vjs viijd" (Tyssen 1915, 44) may cast some doubt on this. The third bell of the three recorded in the Edwardian inventory of 1553 survived at Ryarsh until 1879 when it was recast by the Whitechapel bellfoundry; it bore shield 3.0004. It is possible that the word "chaungyng" is significant and the bequest relates to the exchange of a faulty bell, for example.

Shield 3.0044 is firmly rooted in the east Midlands and so probably belonged to Robert Clerke (Fig 28). This attribution is supported by the bell at Wickersley, Yorkshire (West Riding)(4238) which is inscribed "ihc Ex dono dni Johis Elcok". John Elcoke was the Rector of Wickersley 1438-91 (Poppleton 1903a, 27). If this attribution is correct, then the career of Robert Clerke can be extended to 1512 as a bell bearing shield 3.0044 at Huyton, Lancashire (1822) is inscribed with this date. It should be noted, however, that another bell with this stamp, at the Guildhall in Lincoln (2121), was cast "TEMPORE VVILII BEELE MAIORIS LINCOLNIE CIVITATIS". William Beele was mayor of Lincoln in 1371 (North 1882, 514-5) and so, unless this bell was recast by Robert Clerke who reproduced the form of an earlier dedication, this mark must have been used by a fourteenth-century predecessor.

[36] William is first recorded on 7 July 1434 when he cast a new tenor bell for the Abbey of Bury St Edmunds for £20 (Campbell 1998, 73; Badham and Blatchly 1988, 295; Tyssen 1915, 46-7). He appears in the Husting rolls of 1438, and wrote his will 21 October 1439, it being proven two days later (Stahlschmidt 1887, 43).

2.2.4.6 'IB'

Stamp 7.0095 is formed of the ligatured initials "IB". Two bells at Mundham, Norfolk (4573/4) bear this stamp along with the small ermine shield (3.0092) previously attributed to a member of the Brasyer family in Norwich (see above §2.1.4). This association allows the ligatured initials to be allocated to John Baly, who appears in the churchwardens' accounts of East Dereham, Norfolk in 1488 working with Richard Brasyer II (Cattermole 1990, 87-9). He was admitted to the freedom of Norwich as a brasier in 1479 (L'Estrange and Rye 1888, 9), and may be the man who was constable for the Northern ward in 1493-5 and councillor for the Northern ward 1496-1503 (Hawes 1986, 9).

Stamp 3.0055 appears on a bell at Cowthorpe, Yorkshire (West Riding)(4154) which is inscribed "O thou blyssid trinite of bryan rodlyff haf pyte". This shield also bears the initials "IB". Sir Bryan Rouclyggs was made a baron of the Exchequer in 1458. He petitioned Archbishop Booth for leave to rebuild Cowthorpe church in 1455; it was reconsecrated in August 1458 (Poppleton 1903b, 231). "Johannes Bery, belmaker" was admitted to the freedom of York in 1460 (Anon 1897a, 180; Benson 1904; 627, 641). 'IB' may be his initials.

It is not clear whether this founder also cast the bell at Carlisle cathedral which also bears these initials, but not in a shield (0356). This bell was cast by order of Bishop William Strickland (1400-19) in *c* 1402 (Whitehead 1886a, 135-40). This would be too early for John Bery, unless the bell has been recast and may be a little late for the "Johannes Bous, belimaker" who was admitted to the freedom of York in 1355 (Anon 1897a, 180; Poppleton 1905, 88). With these uncertainties, it seems safest to leave this bell unattributed at this stage.

2.2.4.7 London widows and their husbands

A complicated group of stamps must now be considered. Two of them, 3.0008 and 3.0010 bear a lozenge which is the heraldic symbol for womenhood. Women founders are extremely rare, but two are known from London in the early fifteenth century.

On 28 March 1441, "Johane Hille of London widewe" made a contract to provide five new "belles of accorde" for the parishoners of Faversham, Kent (Ellacombe 1881, 115-6;

Stahlschmidt 1884, 51-2; Barron 1994, 105, citing MRO, MS CCL P 146/7/1). Johanna was named executor in her husband's will on 3 May 1440 (Stahlschmidt 1884, 49-51) and wrote her own will on 3 February 1441. This was proven on 30 May 1441 (Barron 1994, 104, citing GL, MS 9171/4, ff. 62v-63).

On 12 December 1460, "Johane Sturdy of Londone widewe" sealed an indenture with the parishoners of Faversham for a new tenor bell (Ellacombe 1881, 115-6; Stahlschmidt 1884, 52-3; Barron 1994, 110, citing MRO, MS CCL P 146/7/2). Fortunately we are able to distinguish the bells of both Johannas on the basis of the initials "IS" which appear on either side of stamp 3.0010 whenever it is used.[37]

This allows us to attribute the other mark with a lozenge, shield 3.0008, which occurs on six bells (Appendix 3), to Johanna Hille, and both stamps to the London foundry.

Moreover, it also allows us to identify the bells cast by the husbands of these women. Shield 3.0009, which appears on 27 bells (Appendix 3), is the same as 3.0008, but without the lozenge, and so can be attributed to Johanna Hille's husband, Richard. He first appears in records on 29 August 1416 when he was sworn master of the founders' craft (Sharpe 1909, 144). In 1422 he was a feoffee in St Bride's parish, Fleet Street (Walters 1912, 375; Barron 1994, 102) and on 6 May 1433 "Richard Hill 'foundour'" and citizen of London appears in the close rolls for 12 Henry VI regarding a charter of the goods and chattels of William Pelham (Anon 1933, 294). On 19 March 1435 he was assessor for the subsidy in Portsoken ward (Sharpe 1911, 197), and in 1436 he is recorded receiving goods and chattels (Barron 1994, 102) and proved the will of Alice Dawe, daughter-in-law of William Dawe, of which he was the sole executor (Stahlschmidt 1887, 25, citing GL MS 9171/3, f. 467v). On 1 June 1437 he witnessed another will (Barron 1994, 100), and in the same year he witnessed a deed involving land in the parish of St Botolph's, Aldgate (Barron 1994, 102). On 21 June 1438 he witnessed, and was the executor, of the will of Alexander Sprott, vintner (Sharpe 1890, 485; Barron 1994, 100), and was involved in establishing his chantry in St Botolph's, Aldgate (Barron 1994, 102). On 11 November 1438 he stood surety for Thomas Morestede, surgeon (Sharpe 1911, 223). In 1439 he was a common councilman and on 11 May 1439 he was a witness in a plea to the mayor (Jones 1954, 13; Barron 1994, 102). His will was written on 3 May 1440 and proven on 6 June (Stahlschmidt 1884, 49-51, citing GL, MS9171/4, f. 44v).

Over a century after his death, in May 1549, "a vestment of green branched damask, the gift of Richard Hill" appears in an inventory of St Botolph's, Aldgate (Walters 1939b, 211).

Bells by John Sturdy can be identified by the initials "IS", when combined with the use of the half-groat stamp without the lozenge (2.0107).[38] It should be noted that the combination of the stamp and the initials is crucial, as 2.0107 without the initials is demonstrably used by later founders.[39] On 19 October 1440 "John Sturdy, bellemaker" gave a piece of silver value 20s to Agnes Powtrell and John Grene, goldsmith (Jones 1954, 164). He appears twice in 1448, once practising as a bell-maker in London and living in St Botolph's parish (Barron 1994, 109) and once described as "late of London, bell maker"(Clarence 1898, 36; Tyssen 1915, 94-95). Perhaps he moved out of London for a time, because in 1449 he is mentioned in the Hustings rolls (Stahlschmidt 1887, 37), and on 10 August 1454 "John Sturdy alias Leycestre, belmaker" gave a gift which was registered in the mayor's rolls (Jones 1954, 180). He appears to have died between this date and 12 December 1460 when his wife, Johanna, is described as a widow in the Faversham indenture. On the basis of this evidence stamp 3.0008 and the eleven bells bearing 2.0107 and the initials "IS" are attributed to the London foundry.[40]

John Sturdy introduces the evidence of initials which can be used to attribute particular bells to foundries, in his case combined with evidence which attributes particular stamps to foundries. But before evidence of this type is discussed further (see §2.3), those stamps

[37] There are twelve of these bells (Appendix 3), with additional unconfirmed examples at Beachampton, Buckinghamshire (0112) and Long Stow, Cambridgeshire (0263).

[38] There are eleven of these bells: Adstock, Buckinghamshire (0104), Piddlehinton, Dorset (0843), Good Easter, Great Totham, and Little Totham, Essex (1023, 1040, and 1086), Gloucester cathedral (1216), Tallington, Lincolnshire (2242), Holton, Oxfordshire (2569), Norton, Suffolk (3321), and Chichester St Martin and Heathfield, Sussex (3526 and 3562). Two further bells may also be attributed to John, an unconfirmed example at Chesham, Buckinghamshire (0122), and a bell from Margate, Kent, which was inscribed with the name of John Daundeleon (1742). From the evidence of his brass which is in the church, he died in 1445 (Stahlschmidt 1887, 349-50). Unfortunately this bell was recast in 1785 before a full record of the stamps was made, but this evidence of date would appear to suggest that John Sturdy may have cast this bell. Two further examples may have been cast by John or Johanna, although they are unconfirmed in the absence of further information: bells at Canterbury St Mary Magdalene, Kent (1677), and Thrapstone, Northamptonshire (2395).

[39] Such as Thomas Lawrence, who uses it along with his grid iron stamp, 3.0022, at Margaretting, Essex (1090).

[40] It should be noted that doubt may be cast on this attribution on the basis of Ellacombe (1881, fig 56), which illustrates a half groat minted at Canterbury after 1465 (Keene pers comm 2006). If this illustration is accurate bells bearing this stamp cannot be by John Study, who was dead by 1460. Unfortunately the other published illustrations of this mark (Raven 1906a, fig 23; Elphick 1970, plates X and XVII; Walters 1906b, fig 4f) are illegible, and so there is no way to check this attribution short of further fieldwork. Textual descriptions of this mark are in the form 'the Sturdy half groat'

which bear initials or rebus devices but which have not yet be assigned to foundries should be mentioned.

2.2.4.8 Post-medieval shields

Two stamps which probably belonged to post-medieval bellfounders have been included in this study in error.

3.0063 bears the initials "HO" for Henry Oldfield I of Nottingham (*c* 1539-89; Halls and Dawson 2000, 305).

3.0084 bears the initials "TN". This belonged to a Thomas Newcombe of the Leicester foundry. Unfortunately there are two founders with this name, the Thomas Newcombe, who had once been married to Margery, wife of Thomas Bett, and his grandson, the Thomas Newcombe who inherited the foundry of his father, Robert Newcombe in 1557. The career of Thomas Newcombe II falls outside the period of this study; that of Thomas Newcombe I falls within it. "Tho Newcom, yoman" entered the Merchant Gild and became a freeman of Leicester in 1507 (Bateson 1901, 467; Hartopp 1927, 61). Financial transactions are recorded in the Borough records on 14 February and 5 April 1508 (Bateston 1901; 378, 445). He was chamberlain in 1509/10, auditor for the north quarter in 1511/12, 1513/14, and 1515/16, and coroner in 1518-20 (ibid; 462, 465, 469-70). He wrote his will on 20 March 1520 and it was proven in Lambeth on 25 August (North 1876, 42-3, citing PCC, 32 Ayloffe). In his will he describes himself as "Thomas Newcombe of Leicester bellfounder". There is considerable doubt expressed in the literature over whether Thomas Newcombe I cast bells at all, 3.0084 being almost universally attributed to his grandson (1557-80; North 1876, 48; Halls and Dawson 2000, 304). For this reason bells bearing 3.0084 have been omitted from the data considered here, even though a number of them are distinctly pre-Reformation in character. It is certainly possible that some of these bells may be by Thomas Newcombe I, although this could only be investigated by analysis of the whole sixteenth-century Newcombe foundry which is beyond the scope of this study.

2.2.4.9 Stamp 3.0013 and 'IW'

Next the rather complicated possibilities raised by shield 3.0013 must be considered. This is a rebus shield of a founder whose initials were probably "IW". There are considerable problems (Bayliss 1987, 45) with the suggestion (Cocks 1897, 31; Deedes and Walters 1909, 30) that this shield belonged to the John Walgrave described as "servaunt of Wyllyam fondour" in the will of John Plot and bequeathed 3s 4d (Furnivall 1882, 15), as there is no evidence that this man was a bellfounder at all.

More recently evidence of another London founder, John West, has been discovered. He was sworn as a master founder on 5 September 1432 (Sharpe 1911, 148) and was an executor of the wills of both Richard and Johanna Hille (Barron 1994; 104, 108). In October 1442 he drew up his own will which shows that he was an active bellfounder in the parish of St Margaret, Lothbury with two apprentices and a servant (Barron 1994, 104, citing MS 9171/4, f. 111v).

Although the distribution of surviving bells bearing stamp 3.0013 (Fig 29) supports the suggestion that its owner may well have been a London man, there are four other founders with the initials "IW" to be considered.

John Wooley worked in Nottingham, first appearing in the lay subsidy rolls for 1523/4 as "De Johanne Woley, servienti, pro stipendiis suis...xxd" (Stevenson 1885, 162-3). He cast a bell for Orton, Westmoreland in 1530 (Thompson 1970, 56) and on 30 June 1535 Richard Seliok II (see below §2.3.7) sued the churchwardens of Grantham parish church for making the moulds to recast a bell for them, which they subsequently sent to "Johanni Wolley, belfounder, hic apud Notingham praedictam" (Stevenson 1885, 198-201).

There are also no less than three founders named John White, two working in Bristol and one in Reading, all in the sixteenth century. "John White the elder of St Philip's parish, in the city of Bristowe, bellfounder" wrote his will on 6 October 1540 (Tyssen 1915, 58, citing PCC, F21 Alenger). It was proven on 21 January 1541. He appears to have had a long career. The first mention of a John White, "bellyot", who is likely to be this man, occurs in the churchwardens' accounts of St Michael, Bath in 1481 (Pearson 1880, 83). He completed further work for that church in 1485 6 and 1536 7 (Bliss and Sharpe 1986, 19; Walters 1918, 58) and work for Yatton, Somerset in 1530 1 (Hobhouse 1890, 145). On 22 February 1509 "John Whyte de Bristoll' Ceele fownder" sued John Smyth, Mercer for a debt of 6s 8d which was paide on 8 March (Rich 1934, 107), and on 7 May 1535,

the calendar of the apprentice book of Bristol records "Thomas Shepard, son of Edmund, yeoman of Bristol, to John White and Elizabeth his wife for 11 years" (Hollis 1949, 52). It is unclear whether John White I of Bristol is the same man as the pewterer who witnessed the will of William Lombard, Merchant of Bristol on 22 July 1486 (Veale 1933, 238-9) and sued John Estrefeld and John Vaghan, the executors of a will, for 4 marks on 26 January 1513 (Rich 1934, 159), and whose tenement is mentioned in a indenture of William Spenser on 9 November 1504 (Veale 1953, 104-6).

John White I of Bristol had a son, also called John White, who was executor of his father's will (Tyssen 1915, 58). The calendar of the apprentice book of Bristol records that "John Whyte Belfounder and Gladisa his wife" took on apprentices on 9 February and 4 October 1541 and on 23 January 1542 (Hollis 1949; 156, 171, 176). He cast four bells for Tintinhall, Somerset in 1541 (Walters 1918, 58; Hobhouse 1890, 205) and single bells for Chiselborough, Somerset in 1541 and Banwell, Somerset in 1544 (Walters 1929, 266). On 16 May 1550 the calendar of the Bristol apprentice book records "William son of John Whyte Bristol belletter to Anthony Stanbank vintner and Joan wf for 16 yrs App to have at end 40/-, 4/6 for the freedin etc" (Ralph and Hardwick 1980, 113). He was still alive on 27 July 1553 as the Edwardian Inventory for Weston-under-Penyard, Herefordshire records "For the casting anewe of iij of the said bells they owe to John Whyte of Brystowe xxvjs viijd" (Walters 1918, 59).

John White of Reading lived and worked in the parish of St Lawrence. From the churchwardens' accounts of that parish we learn that he buried his wife in 1516 (Kerry 1883, 187) and provided various items of metal and timber in 1519, 1520, 1523, 1526, and 1540 (ibid, 14; Cocks 1897, 64-6). In 1534 appears the entry "Rec of John White for the yeres rent of ye tente in the South side of the newe strete endyd at the same sseast...xiijs iiijd" (Cocks 1897, 65). The last entry for the payment of rent on this tenement by John White appears in 1547 (ibid). On 8 February 1529 Thomas Crumwell made an indenture to deliver bell metal to John White of Reading and on 18 February 1529 John White entered into a bond with Thomas Crumwell (Brewer 1876, 2344). In 1539 he appears in the (lost) churchwardens' accounts of Thame, Oxfordshire: "Itm paid for an obligacon wt a condicon made betwene the foresaid mast white & the pishe cocernyng the trebull bell...viijd" and "Itm pd for a breakefast.. for mr white of Redyng & the men of london...makyng for the great bell...ijs" (Cocks 1897; 46, 65). On 3 November 1540 he entered into a contract to cast two bells for Westminster Abbey in partnership

with John Saunders (Ellacombe 1875, 108-9), and on 12 September 1542 a soldier was provided with a horse at the joint expense of John White (two thirds) and John Saunders (one third) in the levy for soldiers for the Scottish War (Guilding 1892, 180; Tyssen 1915, 59).

He led an active public life, being guardian of the new town between 1511 and 1519 (Guilding 1892, 122; Tyssen 1915, 59), constable in 1519-20 (Guilding 1892, 140-1), a burgess in 1528-9 (ibid, 152-3), and mayor in 1536-7 (ibid, 164). As mayor, on 2 December 1536, he appears over the manifestoes of Robert Aske at Reading (Gairdner 1888, 498-9). He is recorded as a burgess again in 1537-8 and 1545-6 (Guilding 1892; 171, 193), and was mayor for a second time in 1542-3 (ibid, 177). He was an alderman in 1542-3, 1546-7, and 1548-9 and headed the list in 1550-1 (ibid; 193, 199, 211, 214). He probably died during this year as he is not listed in 1551-2 (ibid, 217).

Given so many confusing possibilities and so little evidence to connect shield 3.0013 with any of these founders or foundries, it seems wisest not to allocate the stamp to a particular worker on documentary and iconographic evidence alone, although from the distribution map of the stamp a Londoner seems most likely.

2.2.4.5 Marks relating to the donors of bells

A number of marks can be attributed to identifiable individuals or families who appear to be the donors or sponsors of a bell or a ring. 3.0037 is the arms of John Newhead or Nailhead, Abbot of St Augustine Bristol (died 1486) (Ellacombe 1881, 13); 3.0038 and 3.0039 are the arms of Gloucester Cathedral; 3.0053 is the arms of Rouclyff; and 3.0056 the arms of John Kempe who was cardinal archbishop of York (1426-52). 3.0064 is the arms of Knollys; 3.0067 the arms of John Beauchamp, Duke of Abergavenny; and 3.0081 the arms of Stapleton. Although 3.0068 is not the arms of Bruton Abbey, it contains the initials "WG" which appear to refer to William Gilbert who was abbot there when the bell was cast in 1528. Of all these identified stamps, only 3.0056 and 3.0067 appear on bells in more than one tower.

A comparison of the number of surviving bells bearing stamps which can be attributed to documented bellfounders, stamps which can be attributed to particular foundries, and bells which bear the shields of their donors or sponsors is shown in Figure 30. It is readily

apparent that all the stamps which occur on more than a few bells were either founder's marks or foundry badges. On this basis a number of other stamps can be identified as potential maker's marks, although their owners are unknown (for example, stamp 3.0085 which occurs on 100 bells, stamp 3.0086 which occurs on 87, and stamp 3.0095 which occurs on 95).

2.3 Initials and documents

The large number of bells which simply bear the initials of the founder who cast them must now be considered. As with stamps which bear initials, inevitably the attributions of founders and foundries to these bells are not as certain as when a name is given in full. Once more, however, the spatial distribution of surviving bells bearing particular sets of initials can be used to provide supporting evidence. Where more than one founder has the same set of initials, the type of the initials themselves can be used to distinguish groups of bells in the same way as the design of the foundry device has been used in the previous section. It must always be born in mind, however, that some medieval bellfounders may not be known from the documentary record.

2.3.1 Bells with initials in the West Country

In the West Country there are 32 bells[41] which bear the initials "tg". The only founder known from the documentary record with these initials is Thomas Gefferies. He is first recorded in 1518-19 when the accounts of St Michael's, Bath, record a payment of £4 13s 4d to "Th belleter de Borstellio" for recasting a bell (Walters 1918; 58, 373), although one of his bells at Curry Rivel, Somerset (2812), bears the name of Thomas Pyper who died in 1509 (Smith 1893, 433; Walters 1918, 59) and so he may have begun business rather earlier than this. He was sheriff of Bristol in 1524-5 (Bickley 1900, ii; 211-2, 240). In 1532-5 payments are recorded to Thomas Jeferes and J Jeferes for casting bells at Yatton, Gloucestershire (Bliss and Sharpe 1986, 19) and in 1534-5 he was paid £9 for work on the bells at South Tawton, Devon (Lega-Weekes 1909, 362; Walters 1918, 58-9). On 18 September 1536 the calendar of the apprentice book of Bristol records "Thomas Poole,

[41] Seventeen bells in Somerset: Charlynch (2781), Curry Rivel (2812), Dawlish Wake (2819), Dinder (2814), Greinton (2845), Hawkridge (2849-50), Holcombe (2856), Holford (2858), Laverton (2887), Ninehead (2910), Purnton (2941), Shapwick (2955), Stoke Rodney (2969), West Hatch (3009-10), and Weston Zoyland (3017); eight bells in Devon: Alwington (0484-5), Brendon (0497-8), Huntshaw (0605), Lynton (0632), Thornbury (0700), and Westleigh (0720); four bells in Wiltshire: Box (3764), Fyfield (3798), Hankerton (3803), and Littleton Drew (3820); two bells in Gloucestershire: Brimpsfield (1176) and Stoke Gifford (1288); and a bell at Wambrook, Dorset (0887).

son of Robert, labourer of Barton in Gloucestershire, to Thomas Gefferys, Bellfounder and Elizabeth his wife for 8 years" (Hollis 1949, 74). He was mayor of Bristol in 1538-9 (ibid; 110-11, 115, 119, 123). He wrote his will on 20 November 1545, and it was proven in the Prerogative Court of Canterbury on 10 July 1546 (Walters 1918, 59, citing PCC, 13 Alen).

The family business was continued by Thomas' son, Harry (1546–*c*1560; Walters 1918, 69). Some of his bells can be identified by the initials "hi" which appear on them.[42] Although Harry probably did not found bells on his own account before his father's death, they have been included in this dataset because they are very difficult to distinguish from those of his predecessors in the absence of diagnostic initials.

Another 11 bells[43] which bear the initials "rt" should be considered at this point. Two founders with these initials appear in the documentary record. Richard Tunnoc famously donated the bellfounder's window in York Minster (Lukis 1871, 419; Frontispiece). He is first recorded on 29 April 1305 when he witnessed a grant of land with buildings in Hornepotlane by Richard de Alverton to William de Beleby (Tringham 1993, 139). In 1306 he appears as a member of a religious guild run by Andrew de Boilingbroke which was dissolved (Swanson 1989, 121; Sayles 1940). In 1311-12, he is recorded occupying a house in Stonegate (Hutton 1984, 2); and he was bailiff of York in 1320-1, witnessing at least ten documents during his period of office (North 1876, 77; Smith 1990, 62; Tringham 1993; 135, 197-9, 257-8, 297-8). He witnessed another grant of land on Barkerhill on 16 July 1325 (Tringham 1993, 21) and was assessed at over £5 in the lay subsidy return for York of 1327 (Swanson 1989; 75, 151). In this year he was also a member of parliament for the city (North 1876, 77; Benson 1898, 20-1), although he was not the mayor (*pace* North 1882, 135). On 6 August 1328 he was granted a license for the alienation in mortmain of 4 marks rent in York to endow a chantry to pray for the souls of himself, his wife Alice, etc, in the patent rolls of 2 Edward III (Anon 1891, 309; Swanson 1989, 159; Dobson 1967, 26 and 34). He witnessed another grant on 31 May 1330 (Smith 1990, 65) and wrote his will and was buried in York minster later that year (Benson 1898, 20-1, citing Reg Dec & Capit, 1, f. 8). In 1280 "Roger de Tauntone, bell-founder, born in

[42] The bells are: Backwell, Butcombe, Clapton in Gordano, Norton St Philips, Somerset (2734, 2768, 2792, and 2914); Colerne, Hankerton, West Overton, Westwood, and Winsley, Wiltshire (3781, 3804, 3881-3, and 3886); and Abson, Gloucestershire (1162).

[43] Four bells in Somerset at Butcombe, Charlton Adam, Fiddington, and Ubley (2767, 2772, 2837, and 3000); three bells in Wiltshire at Box, Great Somerford, and Westwood (3765, 3716, and 3884); bells at

Bristolle" owed 10s to the burgesses of Dorchester, and was working in Bridport (HMC 1887, 489; Walters 1929, 254). It does not appear likely that this group of bells was cast by either of these men. Their distribution is very similar to those of Thomas and Harry Geffries (Fig 31), and so it is likely that they were cast by a founder whose name has yet to be recovered from the documentary record in Bristol.

2.3.2 'WH'

Moving eastwards we come to 11 bells[44] which bear the initials "WH" (Fig 32). No less than five founders with these initials are named in the written sources.

William Hazelwood first appears in the (lost) churchwardens' accounts of Thame, Oxfordshire in 1494 with the entry "Itm Willimo Hasylwood de Redyng p fusione scde campane... xxxvjs xd ob" (Dunkin 1878, 24; Cocks 1897, 58). In 1498 the churchwardens' accounts of St Lawrence, Reading record "Itm rec of the wyfe of Willm Hasylwood for a sete...vjd" (Kerry 1883, 77; Cocks 1897, 59). In 1502 William paid 6s 8d for his wife's grave and 6s for torches and bellringing at her funeral (Kerry 1883, 186; Cocks 1897, 60). He had remarried by 1505, when another wife paid for her seat in church, and wrote his will on 8 March 1507 (Cocks 1897, 60). He cast metal goods other than bells, because in 1507 the accounts record "It payed to Willm Hasylwood for a new holy water stok of laton...ijs viijd" (Kerry 1883, 84). He died in 1509 and was buried in St Lawrence, his will being proven on 10 December (Kerry 1883; 84, 187; Cocks 1897, 60-1, Dunkin 1878, 24).

William Heathcote of Chesterfield was left the foundry in the will of his father, Ralph I, in 1502. He seems to have left the management of the business to his brother, Ralph II, and entered the Church. His will was proven by his nephew, George Heathcote, in 1558. In it he is described as "Sir William Heathcott, priest" (Bestall and Fowles 1977; 36-7, 88). There is no evidence that he ever cast bells.

Clyst Honiton and Horwood, Devon (0527 and 0600); and at Bristol (St Thomas) and Yate, Gloucestershire (1181 and 1311).

[44] These bells are: Chearsley, Hoggeston, and Ilmer, Buckinghamshire (0120, 0152, and 0147), St Anthony in Meneage, Cornwall (0320), Compton, Farley Chamberlayne, Newnham, and Winchester (St Michael), Hampshire (1343, 1352, 1385, and 1443), Broadwell, Oxfordshire (2548), Whatley, Somerset (3018), and Baddesley Clinton, Warwickshire (2481).

William Henshaw, bellfounder, was very active in Gloucester city politics at the turn of the sixteenth century. He is first recorded in 1496 when he was sheriff, holding this office again the next year and in 1501. He was mayor five times between 1503 and 1520 (Lukis 1871, 418-19; Bliss and Sharpe 1986, 36-7). On 13 February 1497 he received part of a tenement and garden without the east gate of Gloucester, a lease dated 2 October being granted "in the time of James Ivy and William Hanshawe, Bailiffs and Sheriffs" (Stevenson 1893, 417-8). On 28 June 1502 he leased a tenement from the Abbot and Convent of St Peter (Bliss and Sharpe 1986, 35-6, citing "Abbot Braunches Register N. 45"). On 25 October 1510 the recognisance of William Henshawe of Gloucester, bellfounder, to appear before the council was cancelled (Brodie 1920, I (i) 346; Bliss and Sharpe 1986, 36-7). According to a commemorative brass in St Michael's, Gloucester his first wife, Alice, died on 2 February 1519 (Haines 1861; cxxx, 69; Lukis 1855, 50). He wrote his will on 2 November 1521, probate being granted on 11 November 1522 (Walters 1911, 113). He was buried under the same brass as Alice in St Michael's, Gloucester (Lukis 1857, 12).

Finally there are two different founders in York named William Hoton, one appears between 1297 and 1300, the other between 1409 and 1445 (Walters 1912, 375; Page 1912, 449-50).

The distribution of these bells fits well with the suggestion that they were cast by William Hazelwood (Fig 32).

2.3.3 'IS'

We now come to the complications raised by the large number of bells bearing the initials "IS" in various types. Those occurring with stamps 3.0010 and 2.0107 and assigned to John and Johanna Sturdy have been discussed above (§2.2.4.7). This leaves twelve of the 41 bells with these initials unassigned. One of these, the recast bell at Hatton, Warwickshire (3670), was inscribed in Flemish with the date 1403 and so is a foreign import and beyond the scope of this study. The other eleven bells fall into two groups—those where the initials occur in gothic minuscules[45] and those where they occur in

[45] There are six of these bells: Quarley, Hampshire (1396); Kimpton, Hertfordshire (1616); Brightwell Baldwin and Waterstock, Oxfordshire (2542 and 2612); Findon, Sussex (3552); and a bell with the initials "isW" at Fulmer, Buckinghamshire (0135). It should be noted that there are further examples of this group which have not been included in this study because they are of a distinctly post-Reformation character (Tyssen 1915, 65-9).

capitals.[46] As all the Sturdy bells appear to have initials in capitals, it is likely that those in gothic minuscules were cast by a different founder.

Of the bellfounders who are mentioned in documents and who have the initials "IS", John and Johanna Sturdy and John de Stafford have already been allocated groups of bells and so may be excluded from consideration here. Four other founders with these initials have so far been discovered.

We have already come across John Saunders, in connection with John White of Reading in 1540 and 1542. He first appears in the churchwardens' accounts of Bramley, Hampshire in 1535-6 when "to the Belfounder of Redyng callyd Saunder 10s" is recorded, with further payments for casting the tenor bell in 1536-7 (Williams 1913, 25-6). In 1540 the churchwardens' accounts of St Lawrence, Reading record that he was paid 8d "for kastinge of lvijli of old brass at jd ob the pound & for xxli of newe brass at iijd the pound" and 8d "for his labour abowt the bells" (Cocks 1897; 66, 71). His partnership with John White in 1540, for casting two bells at Westminster Abbey, has already been noticed (see above §2.2.4.9), but he also cast a clock bell for St Lawrence, Reading in 1543, supplied a bell wheel for the same church in 1545, a bell for St Mary, Reading in 1546, and a hand bell, a little bell, and a "holywat pott" for St Lawrence's in 1547 (Cocks 1897, 71-2). He hung another bell for St Mary's, Reading in 1551, provided a sackering bell for St Lawrence's in 1555, and cast another bell for St Mary's in 1558 (ibid, 72-3). He paid £54 8d for metal from grave brasses and candlesticks from St Mary's in 1546 and £7 13s for scrap metal from St Lawrence's in 1547 (Kerry 1883; 50, 53-4, 124).

Between 1540 and 1553 he was active in city politics, being a guardian in 1540-1 and 1542-3 (Guilding 1892; 174, 179) and becoming a burgess on 18 December 1546 (Guilding 1892, 194-5). He appears as a churchwarden of St Lawrence, Reading on 18 April 1547 (Kerry 1883, 29), and was constable of Reading in the same year (Guilding 1892, 202). After 1546-7 he was a burgess until 1553 (Guilding 1892; 200, 211-12, 214, 217, 225, 231; Elphick 1970, 71). This civic career ended abruptly on 27 May 1553 when he was pilloried with a paper bearing "For lewde and sediscious woordes touching the King's Majestie and the State" and his ears were cut off. Although he had been released from prison by 13 September, he was expelled from the Corporation of Reading (Dasent 1892, 278; Tyssen 1915, 59-60).

[46] There are five of these bells: Drayton, Berkshire (0066); Upton Grey, Hampshire (1420); Aldsworth and

After this episode he may have fostered connections away from Reading as he was admitted as a stranger to the Founder's Company in London in 1554-5 and remained a member until 1557-8 (Parsloe 1964; 129-30, 133, 137, 140, 142, 145; North 1886, 17). Nevertheless he maintained his ties to Reading, contributing 7s towards the cost of a new churchyard for St Lawrence, Reading in August 1556 (Kerry 1883, 200; Cocks 1897, 73). He had a long connection with St Lawrence's, appearing in 1539 and 1540 paying for a seat for his wife who was buried there in 1550 (Cocks 1897, 71-2; Kerry 1883, 190). In 1548 he was charged with the care of the costumes of the Morris dancers and the bells. There was a long running saga about the costumes, which appear to have been mislaid, which was not resolved until 1553 (Kerry 1883, 227; Cocks 1897, 72).

He died and was buried in St Lawrence in 1558. Although he appears to have been intestate an inventory of "the goods & catells of John Saunder late of Redyng" has been recorded (Kerry 1883, 191; North 1886, 17; Cocks 1897, 71-3; Tyssen 1915, 59-61).

The next founder with the initials "IS" to be considered is John Seliok of Nottingham. He is first recorded on 13 October 1473 when he witnessed a grant as sheriff of Nottingham (Stevenson 1883, 416-7). On 12 May 1482 "John Selyok, de Notingham, in Comitatu villae Notingham', brasyer" was accused by the jurors of the western side of regrating corn in the market (ibid, 324-5). The chamberlain's accounts of the city record "to John Selyok for a gallon of wyne gevyn to Ser John' Savage...xs" on 4 April 1485 (ibid, 265). He was mayor of Nottingham in 1498-9, appearing in a valuation of the household goods of Thomas Ball, tailor on 30 November 1498 (ibid, 298-9). In 1499 he is positively identified as a bellfounder when the accounts of the gilds of St George and St Mary in the church of St Peter Nottingham record "and for 7s 6d likewise paid by him to John Selyok bellfounder for making and altering the first bell at the church..." (Hodgkinson 1939, 69; Wilkinson 1929, 100; Dawson 1995a, 164; *pace* Tilley and Walter 1910, 21). He appears again in the chamberlain's accounts for 1499/1500 regarding a transaction about a piece of land "de Johanne Selyok et Ricardo filio suo" (Stevenson 1885, 66-7; see below §2.3.7 for John's son Richard Seliok I). He was an alderman and justice of the peace in this year, sitting in common council to resolve a dispute between Richard Mellours[47] and Mr

Charlton Abbots, Gloucestershire (1166 and 1194); and Aston Ingham, Herefordshire (1455).

[47] Richard Mellours was a prolific bellfounder and an almost exact contemporary of John Seliok in Nottingham. On 20 January 1473 he is mentioned as a sheriff, and appears in the list of freeholders in the town, and in 1478-9 he appears as a supervisor for the work on the New Hall (Stevenson 1883; 292-3, 298-9). In 1484-5 he was chamberlain and was paid for supplying materials for the New Hall (Stevenson 1885;

Wedirley on 18 December (Stevenson 1885; 74-5, 300-4). On 12 May 1501 he sat in common council for the engagement of a pavier for Nottingham (ibid, 309), although he does not appear again after this until 25 January 1504 when he was assessed at £13 8d 2d for an aid of 12d in the pound granted by Parliament to the King (ibid, 435). On 20 November of the same year he is recorded as in receipt of land on the death of Hugh Revell (Phillimore 1905, 33), and in 1505/6 he was mayor of Nottingham for a second time, appearing in an indenture for the gaoling of Thomas Dean for debt on 30 September 1505 and witnessing a grant of 16 acres of arable to Richard Selyok and Alice his wife on 2 February 1506 (Stevenson 1885; 98-9, 436-7). He died in 1507 (Dawson 1998, 135; Halls and Dawson 2000, 305), finally appearing on 9 October when Richard Mailbank of Skypton in Craven, co York draper appears in the patent rolls of 23 Henry VII for not appearing to answer "John Selyock of Notyngham, 'belfounder' touching a debt of £10" (Anon 1916b, 548).

Finally we must consider two more founders with the initials "IS". John Sheffield rented a tenement in Whelewrightgate, Nottingham from the guild of St George of St Peter's church, Nottingham in 1492-3 and died in 1495 when the guild received 3s 4d "for the waste of the torches at the burial of James Sheffeld, Bellyetter" (Hodgkinson 1939; 55, 61; Dawson 1995a, 163).

229, 231-2). The next year "Richard Mellers, bellfounder" gave 20s "of his charitable gift" towards the repair of the bridges at Hethbeth (ibid, 6-11). This is the first of many instances where he is described as a bellfounder, although he only appears in transactions relating to bells on two occasions—in 1499 when he appears in the accounts of the guild of St George and St Mary of St Peter's church, Nottingham receiving 22s "in full payment for all the metal of the second bell" and on 26 April 1497 when Thomas Thurland bequeathed "the balance owed to Richard Mellour for 3 bells for Gamston church" (Hodgkinson 1939, 69; Wilkinson 1929, 100; Dawson 1995a; 79, 164; Raine 1864, 185n). His civic career appear to have begun in 1488 when he was an alderman (Raven 1906b, 177-8). He was mayor in 1499 1500 receiving £20 as his fee for office and is recorded sitting in the common council as an alderman and justice of the peace in 1500 1, 1502 3, and 1503 4 (Stevenson 1885; 58-71, 300-2, 308-9, 311, 325-6; North 1882, 102-3). He was not mayor for a second time in 1506, as John Seliok held the office (Stevenson 1885, 461; *pace* North 1882, 102-3; Raven 1906b, 177-8; Poppleton 1905, 95; Tilley and Walters 1910, 21). He held a variety of property in Nottingham, appearing in a grant on 30 August 1486 and receiving a grant of part of a messuage in Castlegate with his wife, Agnes, on 11 February 1488 (Stevenson 1885, 427-9; Cocks 1897, 192). He received part of a messuage on the southern side of the Sunday market by the will of Margaret, relict of William Forde, dated 18 June 1494 (Stevenson 1885, 431), and leased some land on 2 December 1505 (Stiff 1872, 81). Apart from the dispute with John Wedirley, he appears rarely in litigation; although he sued John Creket and others for debt in 1505 and appears in the patent rolls of 22 Henry VII on 10 April 1507 when he was granted "Pardon to Richard Mellours, alias Mellers, of Nottingham, 'belfounder' for offences committed before 26 February 1507 against the statutes of weights and measures" (Stevenson 1885; 98-9, 303-4; Anon 1916b, 537). In 1503 4 he was assessed at £9 2s for an aid of 12d in the pound granted by Parliament to the King (Stevenson 1885, 435). He wrote his will on 7 January 1504, although it was not proven until 2 August 1515 (Collins 1891, 114, [illegible]; Raine 1884, 41-2). He was dead by 18 October 1508, however, as his wife is described as "Dame Agnes Mellers, widewe" in an arbitration of that date (Stiff 1872, 81; Stevenson 1885, 437).

John Sutton was based in Norfolk at the turn of the fifteenth century. In 1370 William and John Sutton pleaded against Thomas Letbetere for damages of £20, for ruining a bell they were casting in an enclosure next to St Nicholas, Yarmouth by throwing 19lb of tin into the melt (Cattermole 1990, 145). We do not hear of him again until 1402 when a property immediately west of St John Timberhill, Norwich was conveyed to William de Sutton, John de Sutton, and others (ibid). He appears to have settled in Norwich about this date because in 1404 "John Sutton, Belleyeter" was admitted to the freedom of the city (L'Estrange and Rye 1888, 133; L'Estrange 1874, 25).

Figure 33 shows the distribution of bells bearing the initials "IS". From this it is clear that the bells where the initials are inscribed in gothic minuscule may well have been cast by John Saunders at Reading, and that it is difficult to see how any of them could have been cast by founders based in either Nottingham or Norfolk. The attribution of the bells with initials in minuscule to John Saunders is supported by the bell at Fulmer, Buckinghamshire (0135) which bears the initials "isW". As we know that Saunders was working in partnership with John White in the early 1540s, this bell may be by them.

The remaining bells where the initials appear in capitals are more difficult, and they may well not be by the same founder because at least three different sets of capitals appear on them (Appendix 3), and they appear to be widely scattered. It is perhaps safest to leave this group unallocated simply on the basis of the initials they bear.

2.3.4 'WK'

The next bells to be considered are those bearing the initials "WK".[48] There are three people mentioned in the documentary record with these initials, a father and son sharing the name William Knight in Reading and William King, "belman" who was admitted to the freedom of York in 1435 (Anon 1897a, 150). This William may not have been a founder at all, but a worker concerned with hanging bells and in any case, two of the bells with these initials, those at Letcombe Bassett, Berkshire are dated in arabic numerals 1576 (Sharpe 1970, 167-9). These must belong to William Knight II who is recorded between 1536 and 1587 when he died (Cocks 1897, 119-22; Walters 1912, 376). As with

[48] Six bells bearing these initials, each undated and of "early" character have been included in the dataset: Lockinge, Berkshire (0080) and Greywell, Long Sutton (3 bells), and Newton Valence, Hampshire (1356, 1375-7, and 1386).

Thomas and Harry Gefferies, the problem is to disentangle the bells of the father and son—in this case even when they bear the initials!

William Knight I is first recorded in 1510 when he was admitted to the Founders' Company, London (Parsloe 1964, 31), being recorded as a liveryman in 1514 (Hadley 1976, 17). In 1517-18 he was constable of Reading (Guilding 1892, 134-5). In 1518-19 he was Under Warden of the Founders' Company, London (Cocks 1897, 118; Parsloe 1964; 50-1, 54-5), and churchwarden of St Lawrence, Reading in the next year (Cocks 1897, 118; Sharpe 1970, 207). In 1525 he paid for the year's mind of William Lendall, who had been buried in St Lawrence, Reading in 1515-16 (Cocks 1897, 119). In 1527-8 he was Upper Warden of the Founders' Company (Parsloe 1964; 71, 73) and in 1529-30 and 1530-1, Master (Cocks 1897, 118; Parsloe 1964; 78, 81-2; Hadley 1976, 34). He was buried in St Lawrence, Reading in 1535 (Cocks 1897, 119). It is not clear whether William Knight I actually cast bells or was simply a general bronze founder. There was certainly healthy competition from John White in Reading at this period.

William Knight II is first recorded in 1567 when he was casting bells for St Lawrence, Reading. He may also not have cast bells until later in his career, perhaps when the demise of John Saunders left a gap in the market—certainly his only dated bells are those of 1576. Nevertheless, it is certainly possible that dating bells simply became fashionable, and that some of the undated bells were cast during the life of William I or the earlier years of William II.

2.3.5 'ID'

Turning now to eight bells[49] bearing the initials "ID" we reach firmer ground. Only one bellfounder with these initials is known from documents. John Danyell appears in the Mundham Books at King's College, Cambridge as a bellfounder and vintner between 1456 and 1460 (Raven 1882, 28; Cocks 1897, 36; North 1886, 21; Walters 1932, 294), casting four bells for the college. One of these appears to have survived there until 1756 when it was recast by the Whitechapel bellfoundry, as a bell with the initials "ID" was recorded at that time (0211). It is not very easy to identify John in the London records of this period as he does not appear to have identified himself as a bellfounder, but he may

[49] Chellington, Bedfordshire (0007), St Botolph's and Kings College, Cambridge (0214 and 0211), Cranham and Great Maplestead, Essex (1000 and 1039), Winchester St Bartholomew Hyde, Hampshire (1436), Torksey, Lincolnshire (2253), and Bildeston, Suffolk (3107).

well be the man who witnessed a gift registered in the mayor's rolls on 16 September 1454 (Jones 1954, 180), and the "John Danyell, grocer" who received a gift registered in the mayor's rolls on 28 August 1459 (Jones 1961, 153). The "John Danyell, brewer" who received a gift registered in the mayor's rolls on 3 August 1438 was probably a different man (Jones 1954, 161).

2.3.6 'TH'

The next group of bells may also be attributed to a founder who is mentioned in the accounts of King's College, Cambridge. Thomas Harrys "del London belfounder" appears in 1478-9 (Stahlschmidt 1884, 88-9; Raven 1882, 29) and is probably the founder of eight bells which bear the initials "TH".[50] The only other candidate, Thomas Hickham, sacrist of St Augustine's, cast a bell for Canterbury Cathedral in 1358 (Hasted 1801, (II) 207; Raven 1906b; 71-2, 159). This suggests that he was a part-time founder who only cast for his community, certainly not the founder of such a widely dispersed group of bells as those with the initials "TH". If the attribution of these bells to Thomas Harrys is correct, and they do not belong to a later, undocumented, founder, then either his career extended well into the sixteenth century or the bell at Hampton Court, which was founded by Cardinal Wolsey in 1515 (Law 1900, 3), must have been purchased second hand.

2.3.7 'RS'

Turning to 17 bells found in a tightly spaced group in Somerset and on its border with Devon[51], we need to consider founders with the initials "RS". Three of these are known.

Richard Seliok I of Nottingham, son of John Seliok, has been mentioned above (§2.3.3). He is first mentioned with his father in the land transaction of 1499/1500 and received a grant of 16 acres of arable land in the fields of Nottingham, Lenton, and Radford from the will of Thomas Werner dated 2 February 1506 (Stevenson 1885; 66-7, 436-7). On the 11 April 1512 the entry "Item Ric Selyok for a cley pytte at the bakside of his howse...iiijd" appears in the presentments of the Mickletorn Jury (ibid, 338-9) and so he certainly

[50] Althorne and Henham, Essex (0961 and 1047), Hampton Court, Middlesex (2301), Blatherwyke and Pottersbury, Northamptonshire (2322 and 2376), Limpsfield, Surrey (3481), Hove, Sussex (3565), and Lillington, Warwickshire (3679).
[51] Challacombe, Culmstock, East Anstey, and Plymtree, Devon (0520, 0545, 0556, and 0677) and Bradford, Coombe St Nicholas, Elworthy, Exton, Holford, Mapperton, Norton sub Hambdon, Skilgate, Stoke St

continued the business. In 1517 he cast three bells for Childwall, Lancashire (Stewart-Brown 1913, 100-1), and on 24 February 1518 William Stainbank issued a complaint against him for not arresting Richard Ireland at his request on 19 September 1517 when he was sheriff (Stevenson 1885, 144-9), so he did hold public office. He wrote his will on 16 June 1522 and it was proven on 19 May 1523 (Collins 1891, 156, citing Reg Test Ebor, 9, f. 391; Greenwood 1995, 170; Dawson 1998, 135).

A second Richard Seliok appears in Nottingham firstly on 16 May 1530 when he witnessed the inquisition on the death of John Williamson (Phillimore 1905, 201), and then on 29 September 1531 when he paid 4d for a parcel of land on Tymberhille, 2d "for his porche in Castelgate", and 12d, with the prior of the Whitefriars, for "a comen lane bytwen Seint James Lane and Berwardlane" (Stevenson 1885; 366-7, 369). He was certainly a bellfounder because on 28 June 1536 "Ricardus Seliok, de villa Notingham', belfounder" sued the churchwardens of Grantham parish church for making the moulds to recast a bell for them, which they subsequently sent to John Wooley (ibid, 198-201; see above §2.2.4.9). On 3 June 1538 he was sworn as a juror in confirming the rights of the mayor and burgesses in Sherwood forest (ibid, 212-5). His will has not yet been traced, although he appears to have been alive in 1548 (Walters 1912, 381; Halls and Dawson 2000, 305).

The third founder with the initials "RS", Roger Sempson, appears in only one document—the churchwardens' accounts for 1558-9 of Woodbury, Devon (Ellacombe 1872; 29, 173). It is not clear whether his career extends before the Reformation. However, on the basis of their spatial distribution he is certainly the most likely maker of this group of bells.

2.3.8 'RW', 'PW', and 'R'

Three bells with the initials "RW"[52] should now be mentioned. These do not form a coherent group and it is likely that the bell at St Helen's Auckland, Co Durham was cast by a different man to those in Somerset. It is unlikely that any of the bells were cast by

Mary, Stoke sub Hambdon (2), Thurloxton, and Upton (2752, 2798, 2830, 2835, 2857, 2901, 2915, 2957, 2971, 2973-4, 2991, and 3002).

[52] St Helen's Auckland, Co Durham (0946) and Charlton Canfield and Preston by Yeovil, Somerset (2773 and 2936).

Richard de Wimbis (see above §2.1.1), the only founder known from documents with these initials, because he cast his name in full on at least some of his bells.

Similarly it is likely that the five bells bearing the initials "PW"[53] were not cast by Peter de Weston, also the only founder known from manuscript sources with these initials and a man who on occasion put his name on his bells (see above §2.1.1). The capitals on these bells (8.0191) are different from those used by Peter de Weston on the bells bearing his name, although those at Ridgewell, Essex (1116) seem to be an enlarged version of those used by Peter de Weston at Ingatestone, Essex (1051).

Without this bell, the distribution of surviving bells is confined to south central England and is very similar to that of ten bells, where known inscribed in the same capitals, bearing the initial "R"[54] (Fig 34). This single letter is insufficient for a link between the documentary record and the physical bells to be established, although the number of bells inscribed in this way suggests that "R" was the founder rather than a donor.

2.3.9 Rare and single initials

There are seventeen further sets of initials which appear on single bells, or in the case of Whitburn, County Durham, on a pair of bells in the same tower (Table 3). As for foundry shields, there is a real possibility that some of these initials may relate to sponsors or donors of bells rather than to their founders. For example, Fair (1949, 108-9) suggests that the initials "UC" inscribed on the treble at Distington, Cumberland (0362), may not be those of the founder, but William Curwen, owner of a third of the manor (died 1403), and Cattermole (1990, 167) suggests that "ER" on the crown of the second at Fritton, Norfolk (4470), may be for Edward VI. This does not mean that some of these bells do not bear the initials of their founders, just that they cannot be attributed to particular founders without considering the evidence provided by the incidence matrix of stamps and bells.

[53] Ridgewell, Essex (1116), Whitwell, Isle of Wight (1432), Appledram, Sussex (3504-5), and Broadchalke, Wiltshire (3767).
[54] Milton Abbas and Osmington, Dorset (0828 and 0839), Chale, Isle of Wight (1329), Swyncombe, Oxfordshire (2609), Upper Beeding, Washington, and Yapton, Sussex (3614-5, 3618-9, and 3633), and Downton, Wiltshire (3792). A bell at Penselwood, Somerset (2927) is probably not part of this group as it is inscribed in gothic minuscules.

There are also a few bells which bear single initials (Table 4), again these could relate to donors or sponsors rather than founders or their foremen. Only the initials "T" and "W" appear on bells at more than one tower, but as "T" occurs at Woodbury, Devon (0735), and Old Beckermet, Cumberland (0389-90),[55] and the seven bells bearing "W" have inscriptions using no less than five different sets of capital letters, it appears unlikely that either set of bells forms a coherent group relating to particular founders. The bell at St Mary, Weeke, Hampshire (1422), may be dated by a brass in the church which records that the bells were recast in 1498 (Tyssen 1915, 71).

2.4 Complex cases

This concludes the evidence of inscriptions which bear the name or initials of the founder, and more complicated evidence which can be used to date bells must now be considered. This falls into a number of categories of varying degrees of security, but it basically relates to local documents which concern the churches in question or to people, usually donors, whose names appear both on bells and in the documentary record.

2.4.1 Bells bearing names other than the founder's

Details of these bells appear in Table 5. First, there are cases where the dates of the person concerned is known exactly and so a date range for the bell may be given. For example, John Leglon who is recorded as Bishop of Lincoln on a bell at Wooburn, Buckinghamshire (0199), held the see between 1521 and 1547, and so this bell must have been cast between those dates (Cocks 1897, 640-1). Most of the bells in this category are inscribed in the form "[person] Me Fecit Fieri" or a variant thereof, implying that the donor was alive when the bell was cast. It is therefore possible to ascribe *termini ante quem* to those bells inscribed in this form where only the date of death of the relevant person is known. For example, a bell at Bitterley, Shropshire (2655) was cast "PER LE ORNYAUNCE ALEIS STURYE", and Alice Stury is known to have died in 1415 (Walters 1906a, 188). This bell must therefore have been cast before this date.

A few bells are not dedicated to their donors, but prayers are offered "pro aiabus [person]". In these cases the bells must date after the deaths of the individuals concerned, probably fairly shortly thereafter, particularly when money was given in wills specifically

[55] Although there may be another example at Lamplugh, Cumberland (0381).

for their purchase. The gap between the death of the individuals and the casting of the bells cannot be proven, however, and so strictly these dates provide only *termini post quos* for the bells concerned. An example of this type is provided by a bell at Isleham, Cambridgeshire (0253), which is inscribed "sce gabriel ora p aiabs Johis bernard milit t clene uxis sue t thome peyton armigi t margarete uxis sue filie t hered pdicto Johis t clene". There are brasses in the church to these men showing that John Bernard died in 1451 and Thomas Peyton in 1484, thus demonstrating that the bell must have been cast after 1484 (Raven 1882, 153-4). A bell at Bempton, Yorkshire (East Riding)(4004) demonstrates a different variety of this argument as it is inscribed "CAMPANA IOHANNIS DE THYNGE PRIOR IHC". John Thweng became prior of Bridlington Priory (of which Bempton was a chapelry) in 1361 and so the bell must date from after he assumed office (Anon 1893, 4).

A further group of bells bears the names of people whose dates are known only imperfectly from the documentary record, or whose identification is equivocal. In these cases only the most general indication of the date of the bells concerned can be derived. This information is too imprecise to act as part of the independent standard against which the results of the mathematical approaches outlined later in this study are validated, but may be used as supporting evidence, in the same way as the distributions of bells with particular stamps have been treated. For example, a bell at St John's, Coventry, Warwickshire (3659), bears the name of Henry Dodenhale who was mayor of the town in 1365 (Tilley and Walters 1910, 144-6). As it was cast when this man was alive, it was probably cast in the fourteenth century: in this case perhaps earlier rather than later in the century because Henry would probably have been well established in his civic career, and so middle-aged, when he became mayor. A bell at Lessingham, Norfolk (4539), was donated by Edmund Norman. A man of this name died Lord of Filby in 1444 and was buried in Cromer; he had a son also called Edmund. Parkin (1810, 218; 1808, 328) could find no connection between them and Lessingham, although there was a family called Norman there in 1435. It seems safest to leave information of this type out of account here and so it is not listed in Table 5, but mentioned as circumstantial supporting evidence when relevant bells are discussed elsewhere.

2.4.2 Bells recorded in medieval documents

The details of a few bells are known purely from pre-Reformation documentary sources, for example the old ring of five bells at Evesham Abbey (3918-22) is recorded as existing in 1354 (Walters 1932, 109-117) and it is recorded that the tenor at St Michael's, Coventry (3661), was acquired in 1488 because in "This yr was great peace in the realm, & for joy the churchwardens of St Michael's & other well-disposed people brought to St Michael's a gt Bell, & calld it Jesus Bell, on which was---+Jesus Nazarenus Rex Judeorum in me misericordia" (Ellacombe 1881, 140).

2.4.3 Bells bearing datable marks

A few more bells can be approximately dated from the marks which appear on them. For example a bell at St Mary the Great, Cambridge (0221), which was recast in 1722, is recorded with a shield bearing the semée of four fleur-de-lys for France, and because these were reduced to three in 1407 this bell must date before then. A bell at Welham, Leicestershire (1947), bears the impressions of three groats of Henry VI (after 1422), and one at Meriden, Warwickshire (3685), has impressions of groats and half groats of Richard II (after 1377).

2.4.4 Local documentary evidence

The mass of local documentary evidence, principally wills, which mention bells and bequests for bells must now be examined. So far research has barely touched the surface of this source of information, exemplified by the fact that over 80% of the references known to me derive from Paul Cattermole's pioneering research in Norfolk (1985; 1990). For the purposes of this study, the difficulty with this evidence is to be sure that the documentary record relates to the bell which physically exists in the church tower today. In the absence of a record of the inscription on the bell, there has to be some chance that the existing bell was acquired second-hand and not newly cast, or has been subsequently recast. The second problem in particular may be addressed by the sort of detailed documentary study of particular towers which has so far only been completed for a few hundred in Norfolk (Cattermole 1991; 1992; 1996a-b; 2000).

An example of the potential for this sort of research is provided by Redenhall, Norfolk, where the progress of building the tower can be traced from bequests. Between 1469 and 1498, money was left for casting the tenor bell in 1514, and the parapet was completed

during the incumbency of Richard Shelton, from 1518 (Cattermole 1996b, 16-20). The Edwardian inventory records five bells, weighing 10, 12, 16, 19, and 24cwt (L'Estrange 1874, 195), and the existing tenor bell (4653) weighs 24cwt. From 1573, the churchwardens' accounts give a detailed account of the metamorphosis of the medieval ring of five to the present ring of eight, demonstrating that the tenor bell has not been recast (Candler 1896, 135-48). It is, of course, possible that this bell was acquired second-hand in 1514, although there is little evidence of this during the medieval period (the purchase of second-hand bells was, however, commonplace at the Reformation and during the eighteenth century when many medieval rings were sold to pay for fabric repairs). If the tenor at Redenhall was cast anew, then the use of shield 3.0090 allows us to assign this bell to its founder, as this is the mark of the Bury St Edmunds' foundry (see above §2.2.2) and we know who owned the foundry there in 1514.

This was Thomas Chirche, who inherited the business from his father, Reignold, in February 1498 (SRO/B Pye, f. 74v; L'Estrange 1874, 63; see above §2.2.4.5). In 1500 the Mundham book of King's College, Cambridge records that he recast the second bell of the ring of five there for 20s 4d, and also saucepans and ladles for the kitchen for 16s (Raven 1882, 36). In 1514, in addition to casting the tenor at Redenhall, the parish book of St Mary the Great, Cambridge mentions "an obligacyon for Tho. Church, bell-founder of Bery" (Raven 1869, 15). He was party to two deeds in 1517 (SRO/B/449/2/142; SRO/B/449/2/145) and witnessed the will of John Howton, brasier of Southgate Street on 26 September 1523 (Deedes and Walters 1909, 52; SRO/B, Hood 149). He was an extremely wealthy man, being assessed at £200 in south ward of Bury and £14 for goods in Eyke in the lay subsidy of 1524 (Anon 1910a; 238, 424). In 1526-7 he appears in the Rental of the Abbey, renting six tenements in Southgatestreet and one, on behalf of the Gild of St Nicholas, in Groshallstreet (Deedes and Walters 1909, 51; SRO/B/A6/2/1). He wrote his will on 12 July 1527 and it was proven on 9 January 1528 (SRO/B, Hood f. 154; Tymms 1850, 261). His estate was valued in the lay subsidy of 1534 as "Villa de Bury. Thomas Churche, Befounder. £400" (Raven 1906b, 173), making him one of the richest residents of Southgate on his death (Gottfried 1982, 40).

In a few instances bequests may be reasonably securely linked to extant bells. There is a bequest in 1522 by Thomas Karr for the smaller bell at South Bergh, Norfolk (4682)(Cattermole 1985, 409). There were two bells in 1553 and there are still two, of which the extant bell is the treble. This bell bears shield 3.0091 which was used by the Brasyer

family (see above §2.1.4). Its occurrence on this bell of 1522, after the death of Richard Brasyer II in 1513, suggests that it was also used by the successors to his business in the early sixteenth century. The existing bell at Weasenham, Norfolk (4733), appears to be the second bell of the three recorded in the Edwardian inventory, as the treble and tenor of this ring were sold by faculty in 1816. In 1534 Isabel Buntynge bequeathed 6s 8d "to the makinge of the secunde bell in the seyd churche" (L'Estrange 1874, 235), and so this bell should have been cast shortly after this date. The second of the ring of two medieval bells at Colney, Norfolk (4421), which are noted in the Edwardian inventory of 1553, should also be dated by a bequest of 5 marks towards the larger bell in the steeple in the will of William Amy of 1467 (Cattermole 1990, 176).

Leaving Norfolk, just two examples provide secure enough attributions for inclusion here. The ancient clockbell at Braintree, Essex (0983) was set up in accordance with the will of John Pepper, dated 1519, who left 20s "to the charges of a newe clocke bell to be made, to serve for the cloke of the church of Braintree" (Deedes and Walters 1909, 188). The present seventh at Easebourne, Sussex (3541) is the "fythe bell biggest of all" which Sir David Owen instructed his executors to purchase in his will of 1520-30 (Elphick 1970; 69, 295).

There are several other documentary references which provide strong circumstantial evidence for the dates of particular bells. Although this information is not strong enough to be truely independent of the analysis of the occurrences of stamps, it may be adduced as supporting evidence for dating or attributions adduced by other means and so is mentioned as relevant when these bells are discussed later in this study.

2.5 Conclusion

The detailed discussion in this part has set out the evidence of bell inscriptions, manuscript sources, and heraldry for the founder, foundry, and date when certain medieval bells were cast. It is clear that the strength of evidence for each attribution, and so its certainty, can vary. Only evidence independent of the incidence matrix of bells and types has been considered, however.

Of the 4797 bells considered in this study, 829 have some indication of founder, 1178 some indication of the place of manufacture, and 1190 some indication of date. In total 1480 of the 4797 bells (31%; Fig 35) have some information relating to their manufacture which is external to the typological characteristics of the bells or their inscriptions. In fact most of this information relates to bells which bear inscriptions and foundry marks, as 1400 of these bells appear in the incidence matrix of bells and their stamps. Evidence of at least one stamp is recorded on 3390 bells in this dataset and so 41% of the data analysed in the following parts of this study can be interpreted in the light of the independent standard described here.

There is some indication, however, that this standard may not be spread evenly across all medieval foundries. Figure 36 shows the distribution of bells which have some independent indication of the place of manufacture. Comparing this with the distribution of all the bells included in the study (Fig 1) shows some interesting differences. For example, there appear to be disproportionately few bells associated with documentary evidence in the Welsh Marches, in contrast to East Anglia where such bells are much more common. These differences arise for a complex of reasons. The survival of city records and the amount of research which has been done on them plays a part, but the adoption and identification of rebus shields also provides independent evidence for large numbers of bells. The bells of foundries where such trademarks were not adopted are far harder to identify using evidence outside the incidence matrix.

CHAPTER 3

THE EXPERIMENT – CLASSIFICATION

(CLUSTER ANALYSIS)

> *"All the real knowledge, which we possess, depends on METHOD; by which we distinguish the similar from the dissimilar"* (Linnaeus 1737, lxi).

Classification is the process of grouping units which are similar on the basis of the similarity of their attributes. In this example, the process is to form groups of bells on the basis of the presence or absence of makers' marks, or to form groups of makers' marks on the basis of their presence or absence on bells.

There are, of course, numerous potential classifications for any given set of entities and so it is critical to define the purposes of the analyses. Of the seven generic uses for clustering techniques listed by Everitt (1980, 6), the most applicable to the present application are:

- finding a true typology
- data reduction
- prediction based on groups
- data exploration

To take each in turn, there are two true typologies which we aim to define by the analyses. First is that relating to founders: we aim to define groups of bells which were made by particular craftsmen, and to define the groups of stamps contained within their work-boxes. Second is that relating to foundries: we aim to define groups of bells which were made by related craftsmen working from a particular location, and to define the groups of stamps used in those places. Both of these typologies are "true" in that they are based in a physical reality. Each bell was cast by a particular craftsman who was based in a particular place and had access to a certain group of stamps.

Starting with an incidence matrix of 3390 bells and 1116 stamps, data reduction is obviously a priority! Simply to make the analyses practical, the original matrix has been reduced in two ways. First by representing each bell by a typical specimen which is recorded with exactly the same stamps. For example, the 57 bells bearing just stamps 1.0001, 3.0001, and 3.0002 are represented by bell 0201 and the four bells bearing these three stamps along with 8.0001 are represented by bell 1597. This reduction in the matrix

occurs without penalty since a single occurrence of a stamp on a bell by a particular founder is enough to determine that that stamp was included in his work-box. How many bells survive with those marks is, for the purposes of classification, irrelevant. Second, all bells which are recorded with only a single stamp are excluded, as are all stamps which occur only once. Neither these stamps nor these bells have co-occurrences which contribute to the classification process, and so again there is no reduction in the relevant information included in the matrix.

By these means the initial 3390 x 1116 matrix has been reduced to the 1289 x 509 matrix which forms the input into the mathematical approaches discussed in Chapters 3 and 4. The results of the analyses, however, can be back-tracked onto the original matrix. So, for example, if the analysis suggests by whom, where, and when bell 0201 was made, then this information can be extrapolated to the other 56 identical bells in the original matrix. Equally if the analysis suggests the foundry which used stamp 3.0001, then bell 2023, which is recorded with only this stamp, can be allocated to a centre of production.

This is not the end of data reduction. Even a 1289 x 509 matrix is far too large for trends to be discernable by eye, and so it is an important aim of the analyses to produce interpretable patterns from the sheer volume of data.

The final two aims of the grouping procedures are rather less well defined. There is certainly an element of prediction based on groups, for example the relationships between groups attributed to founders may be used to predict where those founders were based. There is also simple data exploration: even in a dataset where so much is known from information external to the data matrix, there is undoubtedly useful information which is currently only known from within that matrix.

In this section, three varieties of cluster analysis are used to discover groups in the data matrix. These are an hierarchical agglomerative method (single-link cluster analysis), an iterative partitioning approach (k-means), and a non parametric technique (shared near-neighbour clustering). Correspondence analysis has also been applied to these data, and is discussed in relation to both the partition of the data into groups and to ordination in Chapter 4. A general description of each technique is presented as part of the discussion of its strengths and weaknesses for the analysis of this dataset. Detailed mathematical

definitions are, however, not provided as these are easily available elsewhere and are referenced as appropriate.

Much of the description of the basic methods is based on a relatively small number of sources. For cluster analysis in general I have found most useful Aldenderfer and Blashfield (1984) and Everitt (1980), using Doran and Hodson (1975, chapters 6 and 7), Baxter (1994, chapters 7 and 8), and Shennan (1988, chapter 12) for a specifically archaeological viewpoint. For descriptions of the algorithms involved, a few more technical sources are required (eg Hartigan 1975; Jarvis and Patrick 1973).

All analyses have been undertaken using either the Institute of Archaeology packages (Hodson and Tyers 1988) or BASP for Windows (v5.4) (Scollar *et al* 1985; Scollar *et al* 1993).

3.1 Similarity measures for cluster analysis

Following the selection of variables (see above §1.3), the first step in the methods of cluster analysis applied here is the calculation of a matrix of similarity measures. These are numbers used for the quantitative estimation of similarity. Following the classification of similarity coefficients proposed by Sneath and Sokal (1973), they can be divided into four groups.

3.1.1 Correlation coefficients

The most popular of these is Pearson's product moment correlation coefficient, r, which is transformed into the coefficient ϕ in the case of binary data (Aldenderfer and Blashfield 1984, 22).

Correlation coefficients are sensitive to the shape of the data, that is the vector of attribute values for each case. They are, however, insensitive to the magnitude of differences between each variable. This means that two cases can exhibit perfect correlation (because they have the same shape), and yet not be identical if one is elevated in respect to the other. There are also serious theoretical difficulties with the use of the product moment

correlation coefficient to calculate the correlation of cases, rather than variables, as it is far from clear what the "mean value across different variable types" for a case represents.

Despite this, in some applications, this correlation coefficient proves to be of value precisely because it is entirely shape-dependent and is not influenced by the dispersion and size differences of variables. Problems encountered in using Pearson's r for comparing collections described by percentages of artefact types have been discussed in detail by Cowgill (1990).

3.1.2 Distance measures

These are dissimilarity measures, because if two cases are identical the distance between them is zero. Those in most common use in archaeology are the Euclidean distance (or the squared Euclidean distance), the city-block metric, and Mahalanobis D^2 (Aldenderfer and Blashfield 1984, 25; Mahalanobis 1936).

Distance measures suffer from the problem that size differences of variables strongly affect the estimation of similarity between cases.

3.1.3 Association coefficients

This type of measure describes the similarity of cases which are described by binary variables. Three such measures have been used widely in archaeology (Shennan 1988, 202-8).

First, there is the simple matching coefficient (Everitt 1980, 13; Aldenderfer and Blashfield 1984, 29). This statistic gives equal weight to the joint absence of stamps as to joint presences, which means that some cases can appear very similar because of attributes they do not share rather than attributes which they do. In archaeological applications, where absences may be artefacts of survival or recording as much as reality, this can be a significant problem. It is certainly not suitable for use in this application, as it is demonstrable that the incidence matrix contains only a minority of the actual incidences of stamps on bells because of incomplete recording (see above §1.3.4).

The Jaccard coefficient is defined so that the joint absences of a variable are not included in the calculation of the statistic (Everitt 1980, 13; Aldenderfer and Blashfield 1984, 29). This makes it particularly appropriate for data where presence is of more significance than absence. Because of the known problem of missing (unrecorded) data in the incidence matrix used in this application, this coefficient has been used in this study. It is also archaeologically attractive because if two stamps occur together on a bell, this forms positive evidence that both stamps were physically present in a founder's tool-kit. On the other hand, even if correctly recorded, a joint absence may mean that both stamps were not present in a founder's tool-kit, or that he simply did not choose to use them together.

The third measure, Gower's coefficient (Gower 1971), was designed to enable the inclusion of variables with different scales of measurement in the calculation. However, as this coefficient is identical to Jaccard's when all data are binary (Everitt 1980; Aldenderfer and Blashfield 1984, 31), it will not be discussed further.

3.1.4 Probabilistic similarity coefficients

This type of measure again is most appropriate for data described by binary variables. Using the raw data, cases whose combination causes the least loss of information are combined. These have been used widely in taxonomy and ecology, but have yet to appear in archaeology (Aldenderfer and Blashfield 1984, 33).

3.2 Types of clustering algorithms

Having selected the similarity measure judged most appropriate for a particular application, the next step in a cluster analysis is to select the most appropriate algorithm for the problem. These algorithms have themselves been classified into five groups, although these are not necessarily mutually exclusive (Everitt 1980, 23-4):

(i) Hierarchical techniques, sub-divided into agglomerative and divisive methods
(ii) Optimisation techniques
(iii) Density techniques
(iv) Clumping techniques
(v) Others

Hierarchical techniques, particularly agglomerative techniques, have undoubtedly been the most widely used in archaeology. Classes are formed by hierarchically grouping sub-clusters or splitting parent clusters. Agglomerative methods ultimately join all the entities into a single cluster, and divisive methods will ultimately divide the entire datasets into clusters, each containing a single entity. Both approaches therefore require the analyst to determine when the process should be stopped to provide "meaningful" clusters. In these algorithms once a unit or type has been allocated to a group or divided from it, the allocation or partition is irrevocable. A number of hierarchical techniques have been used in archaeology. These include single-link, average-link, complete linkage cluster analysis, and Ward's method.

Optimisation techniques also partition the data, but do not demand that it consists of hierarchies of small and larger clusters. They also allow the reallocation of units or types between clusters, thus mitigating the influence of a poor initial partition. However, they do demand the analyst to determine the number of clusters which are to be determined (although generally diagnostic statistics are provided which may aid in this decision). k-means cluster analysis is the most commonly used optimisation technique in archaeology.

In the archaeological literature, density search techniques have so far only appeared rarely in archaeometry (Baxter 1994, 181). They attempt to determine modes in the data, or areas in multi-dimensional space inhabited by a concentration of data. Clumping techniques have also not been widely used in archaeology. They are distinctive because they allow overlapping clusters (eg a unit could belong to more than one group), and are attractive for this application because they would allow stamps to belong to a number of clusters relating to different bellfounders.

"Other" techniques include latent structure approaches, maximum likelihood estimation, non-parametric techniques, and graphical models. Some of these have been applied in archaeology (eg García Sanjuán and Rodríguez López 1996; Scott *et al* 1991), although not on a routine basis. Model-based approaches to clustering have also as yet only appeared occasionally (Buck 1993; Papageorgiou *et al* 2001).

3.3 The properties of clusters

There is no formal mathematical definition of a cluster, although there is general agreement that clusters do have five main properties:

- *density*, the property of a cluster which defines it as a relatively thick group of points in space which otherwise has few points. There is no formal measure of this property.

- *variance*, the degree of dispersion of points from the centre of the cluster, although the points may not represent a multivariate normal population.

- *size*, if a cluster can be defined, its radius can be measured. This is however only useful if the cluster is spherical in the space defined by the variables.

- *shape*, the arrangement of points in space; if this is not spherical, then the connectivity of points within the cluster (the relative distance between them) may be a useful measure of this property.

- *separation*, the degree to which clusters overlap or are separated by space containing few data points.

The results of the different approaches to clustering are discussed in relation to these properties in the sections which follow.

3.4 Single-link cluster analysis

This is a hierarchical agglomerative method of cluster analysis. This means that the algorithm searches for the two most similar cases in the similarity matrix and joins them together. It then searches for the next two most similar cases and joins them together. If one of these cases is already part of a cluster, then a new member will be added to that cluster on the basis of its similarity with a single member of the existing cluster. Cases are assigned to clusters one at a time, and so the analysis requires the number of cases −1 steps to be completed. At this point all the cases are joined into a single group. By definition none of the clusters produced by this method will overlap, although some clusters may be contained within others. The algorithm is described by Hartigan (1975, 191-2).

Single-linkage cluster analysis is theoretically attractive, because it is the only direct, hierarchical procedure which satisfies all the mathematically desirable requirements for numeric clustering (Jardine and Sibson 1971; Doran and Hodson 1975, 176). For example, it depends on the relative ordering of similarities, not their absolute values, and so is relatively insensitive to the choice of similarity coefficient. However, it does define non-overlapping clusters, which tend to be serpentine in shape. Types or units can only be members of one cluster, and once allocated to that cluster cannot be reallocated. This means that the clustering process takes no account of the overall cluster structure in the data.

There is, however, a practical problem with the technique which limits its widespread application. This is a tendency to create elongated clusters, where each member is more like its immediate neighbours in a cluster than any members of any other cluster, but may have little or nothing in common with other members of its own cluster. This characteristic is known as 'chaining'. It is generally seen as a demerit of the technique, as it is usually difficult to determine whether the method is determining the actual structure in the data (Hodson *et al* 1966; Baxter 1994, 146).

A second difficulty, common to all hierarchical algorithms, is determining where to partition the tree to form archaeologically meaningful clusters. It is the level in the dendrogram, not adjacency, which is important for cluster definition. Heuristic procedures are usual for determining the partition, and are frequently both subjective and (more importantly) not explicit. The use of a fusion coefficient (Aldenderfer and Blashfield 1984, 53–8) is an attempt to avoid this inexactitude. Perhaps it would be more productive to regard single-link cluster analysis as a tree-forming procedure rather than a method of determining the membership of clusters, and to examine the actual process of chaining to reveal structure in the data.

A third practical difficulty with this technique is that it is very sensitive to data noise (Everitt 1980, 101). Because it relies on a single-link between two very similar types or units, if that (single) data point is erroneous, then the agglomoration of the points will also be erroneous.

How the expected structure in the data fits this model can be discussed with reference to the (entirely imaginary) series of founders and foundries described in Figures 21 and 22 (see §1.5). The example of the marks used by Richard I and Richard II demonstrates that overlapping clusters of stamps may be anticipated, and so single-link cluster analysis may not be the optimal technique for the identification of marks relating to individual craftsmen. However, the method may be better at defining groups of trademarks which are distinctive to particular founders: in the example illustrated in Figure 22, in defining T2 and +5, which are only used by Richard II, as a cluster. This is a 'minimum work-box' group, rather than a cluster which defines all the stamps used by Richard II.

On the other hand, the tendency for single-link cluster analysis to define serpentine clusters may make it an appropriate technique for the analysis of this dataset. The stamps used by Richard I, Richard II, and Richard III do form an elongated chain of groups, and so the technique may have more success in identifying larger foundry clusters. However, any interaction between parallel series, such as that provided by the marriage of Johanna to Richard III (Fig 21) may lead to the agglomeration of different foundry groups. Any incidence of chaining may therefore high-light real links between different clusters, and be archaeologically informative rather than an artefact of the technique. It may be possible to choose between alternative partitions, however, by using the independent evidence to validate them. This means that this application may by-pass one of the major difficulties with single-link cluster analysis, or indeed any hierarchical technique.

The technique may be more successful in identifying clusters of bells rather than stamps, as, with rare exceptions,[1] each bell was made by a particular craftsman and so in reality the clusters of bells by different founders do not overlap.

Single-link cluster analysis was performed using the jaccard similarity coefficient and the reduced incidence matrix of 1289 bells and 509 stamps (Hartigan 1975, 191-2; Everitt 1980, 13). This was implemented using the IAGRAVES module of the Institute of Archaeology package (Hodson and Tyers 1988).

3.4.1 Results (clusters of bells)

[1] Such as the bell at Fulmer, Buckinghamshire (0135) which appears to have been cast by the partnership of John White and John Saunders of Reading in the early 1540s (see above §1.2.4.9).

This analysis produced the overall dendrogram shown in Figure 37, which was partitioned into clusters at similarity coefficients of 1.0, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, and 0.1. The number of clusters produced by each partition is shown in Figure 38. Figure 39 shows the number of bells allocated to clusters in each partition.

Of the 1289 bells in the data matrix, 371 (28.8%) can be assigned to a specific founder and 518 (40.2%) to a place of manufacture on the basis of the information described in Chapter 2. In the dendrograms, bells which have independent evidence of foundry are high-lighted in colour[2]. The accuracy of each partition can be assessed on the basis of the agreement between the results of the analyses with this external data.

The 51 founders whose bells can be identified by the inscriptions or marks which they bear are listed in Table 6, along with the cluster(s) in which their bells are included in each partition. Bells can be assigned to four foundries when the name of the actual founder is unknown, and overall bells from 14 foundries can be identified.

In considering the documentary information relating to the incidence matrix, two types of errors can be found. Type A errors are those of division, where bells known to be by the same founder or foundry occur in different clusters. Type B errors are those of conflation, where bells known to be by different founders or foundries occur in the same group.

In determining the utility of a partition the proportion of bells allocated to clusters is also relevant (Fig 39). Every allocated bell may be assigned to a cluster which is consistent with the documentary evidence, but if only a small proportion of bells are allocated to clusters in a partition then this will not be very informative about the overall structure in the data.

Type A errors relating to bells which have been allocated to founders can be estimated in two different ways. First, the number of documented founders who cast identifiable bells which are placed in more than one cluster by a partition can be calculated. By dividing this number by the number of documented founders whose bells are placed into clusters

[2] In the dendrograms, tables, and graphs (but not the distribution maps) these colours are: Bristol (green), Bury St Edmunds (red), Chesterfield (light blue), Exeter (light brown), King's Lynn (black), Leicester (dark brown), Lincoln (green with red type or blue), London (yellow), Norwich (purple), Reading Wokingham (pink), Salisbury (dark green), York (dark blue); grey denotes bells by known founders whose place of work is unknown or stamps used by multiple known foundries.

by the partition, an estimate of the frequency of Type A errors can be provided. So, for example, bells by 12 founders are placed into more than one cluster by the partition at 0.7, and bells by 29 founders are placed into clusters (Table 6; Fig 40). Consequently the Type A error of this partition is 41% (12/49). This estimate of Type A error for the different partitions of the single-link cluster analysis of bells is shown in Figure 41.

An alternative approach for estimating the frequency of Type A error in this analysis is to examine in detail the allocation of the 371 bells with independent evidence of founder. Pursuing the example of the partition at a similarity of 0.7, bells by William Chamberlyn appear in five clusters: one each in clusters 1 and 3, 23 in cluster 10, and two each in clusters 11 and 12. Consequently cluster 10 appears to most closely identify bells by William Chamberlyn, with six bells by him partitioned into other clusters. This approach is not always so neat. In the same partition, the five clusters containing bells by "William Founder" contain two, five, two, three, and two bells respectively. Nevertheless, for each of the 12 founders whose bells appear in more than one cluster, the number of bells allocated to clusters is totaled, and the number of bells in the cluster which contains most bells by that founder subtracted. These figures are then totaled and divided by the number of documented bells allocated to founders in the partition. This approach provides an estimate of the minimum number of bells which must be misallocated, if the clusters produced by the analysis actually identify groups of bells cast by particular founders. So, for the partition shown in Figure 40, a minimum of 39 bells must represent Type A errors out of a total of 168 documented bells allocated to clusters. By this method, the Type A error of this partition is 23%. This estimate is also shown in Figure 41.

Type B errors relating to bells which have been allocated to founders can also be estimated in two different ways. Most simply this can be done by determining the number of founders listed in Table 6 whose bells a partition places in a cluster with those cast by another founder in that Table. This total is then divided by the number of documented founders whose bells have been allocated to a cluster in the partition. So, for example, examining the partition at 0.7 (Fig 40), bells by the London founders John Danyell and William Chamberlyn appear in cluster 1. Bells by three founders working in Norwich appear in cluster 83, and bells by three different Bristol founders and Robert Norton of Exeter appear in cluster 87. Thus bells by nine of the 29 founders whose bells are allocated to clusters at this level of partition are placed in clusters with another founder.

and the Type B error of this partition is 31%. This estimate of Type B error for the different partitions of the single-link cluster analysis of bells is also shown in Figure 41.

Again, an alternative approach to calculating Type B error is provided by examining the allocation of the documented bells in detail. Returning to the partition at a similarity of 0.7 (Fig 40), cluster 1 contains one bell by John Danyell (2253) and one by William Chamberlyn (4205). Assuming that this cluster is composed of bells by one of these men, one of these bells must be misallocated. Cluster 83 contains three bells by Thomas Potter (3301, 4487, and 3369), two bells by Richard Baxter (4472 and 4532), and one bell bearing the name 'Ricus Brasyer' (4636). The minimum number of bells which must have been misallocated if this cluster relates to the bells of a single founder is three. Cluster 87 contains one bell by Robert Norton (3022), one by Henry Gefferies (3881), three by 'rt' (1181, 3765, and 3716), and five by Thomas Gefferies (0497, 1182, 2814, 2849, and 2845). In this case a minimum of five bells must be misallocated. On this basis, the Type B error of this partition is provided by the total of misallocated bells (9), divided by the number of bells allocated to clusters at this level of similarity (168). This is 5.4%. This estimate relates to the minimum number of bells which must have been misallocated if the clusters produced by the analysis comprise groups of bells by particular workers. This estimate of Type B error is also shown in Figure 41.

The differences between the two methods of estimating the types of error for the partitions are shown clearly in Figure 41. In all cases, a relatively small proportion of the bells by particular founders need to be misallocated. Often a cluster which contains the majority of bells by a founder is identified, but a few bells by the same craftsman are allocated to other clusters (either smaller clusters of bells by that worker which do not join to his main cluster, or one or two bells to a cluster which basically represents the work of another founder).

The most accurate partition for the identification of clusters which relate to single founders is provided by that which contains the least proportion of error whilst allocating the most bells to clusters. Figure 41 shows that partition is that for a similarity coefficient at a level of 0.5. Type A error is at a relatively low level for all partitions, but reduces steadily as the similarity coefficient decreases. In contrast, Type B error increases fairly steadily until, between 0.5 and 0.4, the occurrence of this type of error increases much more sharply. The superiority of the partition at 0.5 versus that at 0.4 is shown even more

clearly in Figure 42, as the overall error of the partition at 0.4 is much higher than that at 0.5 (47.2% versus 29%). Conversely, the number of bells allocated to clusters by the analyses (Fig 39) increases very rapidly as the similarity coefficient lowers until, between 0.5 and 0.4, the rate of increase declines.

This is perhaps shown more clearly in Figure 42, which shows the proportion of documented bells allocated to clusters at each level of similarity against an estimate of the total error of that partition. This estimate is based on the minimum number of bells which must have been misallocated to account for all Type A and Type B errors in a partition. Returning to that at a similarity level of 0.7 (Fig 40), all the Type B errors are accounted for by the misallocations required to remove the Type A errors except for those in cluster 87. Here to eliminate Type B error the three 'rt' bells must be misallocated, allowing cluster 88 to be allocated to this founder, but increasing the total of misallocated bells by two. The total error for this partition is therefore the number of Type A misallocated bells (39), plus two, divided by the number of documented bells allocated in the partition (168). The estimated total error for this partition is therefore 24.4%.

Overall the partition at 0.5 misallocates 29% of bells by documented founders, and allocates 85.7% of documented bells to clusters. The dendrogram partitioned at this level of similarity is shown in Figure 43.

Now considering foundries, the accuracy of different partitions can be assessed in a similar manner (Fig 44). This graph shows that the number of bells responsible for Type B errors is very small, until a sharp increase occurs between similarity coefficients of 0.4 and 0.3. In contrast the proportion of bells accounting for Type A errors decreases much more evenly until this type of error becomes very uncommon in the partition at 0.3. However, this partition has a high incidence of Type B error, so that at a similarity of 0.4 probably represents the optimal partition to define clusters relating to different foundries.

In fact probably the Type A error of this partition has been over-estimated, because two major groups of bells from the London foundry are defined (clusters 1 and 3). The documented founders in these groups all worked in London and are broadly contemporaneous (Fig 45). It seems that there were two separate bellfounding businesses, both of which happen to have been located in London. An estimate of the prevalence of Type A error, if the existence of two foundries in London is taken into account, is also

shown in Figure 44 and indicates that the partition at 0.4 is most accurate in defining groups of bells cast by different foundries. The overall errors of the partitions in defining groups of this type are shown in Figure 46.

Overall the partition at 0.4 misallocates 23.7% of bells cast by documented foundries, and allocates 94.7% of such bells to clusters. The dendrogram partitioned at this level of similarity is shown in Figure 47.

3.4.2 Results (clusters of stamps)

This analysis produced the overall dendrogram shown in Figure 48. This was also partitioned into clusters at similarity coefficients of 1.0, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2, and 0.1. The number of clusters produced by each partition is shown in Figure 49. Figure 50 shows the number of stamps allocated to clusters in each partition.

Of the 509 stamps included in the analysis, 164 (32.2%) are used on bells which can be assigned to a founder and/or foundry. These are high-lighted in colour in the dendrograms. Of these marks, 23 were certainly used by more than one foundry and 96 can be shown to have been in the hands of more than one founder.

In assessing the accuracy of the partitions of this analysis, stamps which have been interpreted as the trademarks of particular founders or foundries are most useful, because they appear only to have been used by their originators and not to have been passed on to successor founders. This must be regarded as a general rather than an absolute rule, however, as a few marks were certainly reused on an occasional basis by successor founders[3] (although such incidences probably amount to less than 5% of the incidences of

[3] The most frequently reused mark is 7.0016, the 'Brede Mark', which has long been regarded as the foundry badge of John Danyell's successor (Tyssen 1915, 40-1). In this dataset, however, it is recorded as in use on a bell by John Danyell (the treble at St Botolph's, Cambridge (0214)), four by William Chamberlyn (Milverton, Warwickshire (3686) and three at Saxton, Yorkshire (West Riding)(4205-7)), four by Bullisden (Rampton, Cambridgeshire (0267-8), Weeley, Essex (1147), Nettleton, Lincolnshire (2145), and East Dean, Sussex (3542)), and with the 'IW shield' (3.0013) five times (Navestock, Essex (1100), Downham, Lancashire (1816-17), South Muskham, Nottinghamshire (2510), and Donhead, Somerset (3791)).

Some of these incidences are in doubt. The use of 7.0016 on the treble at St Botolph's Cambridge is recorded explicitly by Raven (1882, 23-4), although this mark is only recorded on 2-4 of the ring by Lukis (1857, 19), and is implicitly absent by the attribution provided by Ranald Clouston in the Schedule of Bells for Preservation for Ely Diocese, held by the Council for the Care of Places of Worship. The use of the mark by William Chamberlyn is also open to question. 7.0016 is recorded by Tilley and Walters (1910,

these stamps). Thus groups of stamps containing these trademarks may be diagnostic of the tool-boxes of particular founders, or diagnostic of marks used by a particular foundry.

There are 28 trademarks which can be assigned to founders on the basis of their iconography (see above §1.2.3 and §1.2.4). In addition five further stamps may be interpreted as trademarks on the basis of their form and the frequency of their occurrence (Fig 30). These 33 trademarks probably relate to 29 distinct founders, and four founders can be assigned more than one mark. There are also seven stamps which can be assigned to particular foundries on iconographic grounds (see above §1.2.2), and a total of nine foundries from which at least one mark can be identified. These 40 stamps, and the clusters to which they are assigned in partitions at different levels of similarity, are listed in Table 7.

Again, two types of errors can be identified in the clustering identified by the different partitions of this analysis—those of division, where stamps known to have been used by the same founder or foundry occur in different clusters (Type A errors), and those of conflation, where stamps known to have been used by different founders or foundries occur in the same group (Type B errors). Once more the utility of a partition also has to be assessed in the light of the proportion of marks allocated to clusters at a level of similarity.

Unfortunately our assessment of Type A error in this analysis is limited by the very small number of founders to whom more than one trademark can be attributed. Of the four identified, one (T Bullisden) is not relevant as one of his trademarks, 3.0011, is not allocated to a cluster by any of the partitions (Table 7). The trademarks of William Chamberlyn (3.0001 and 3.0002) are allocated to the same cluster in all the partitions in which they are allocated to clusters, as are the two marks attributed to Roger Landen

191) at Milverton, although this seems to be a mis-reference to Cocks (1897, fig 22), as it is not connected to this bell using their own illustrations (and is in fact not present on this bell; Pickford pers comm 2002). Poppleton (1903, 3; 1905, 103) also does not record its use at Saxton, although Benson (1898, 25) does refer to two bells with 'the cross-keys shield' here.

The use of 7.0016 by Bullisden is, however, well attested as it appears with his trademark (3.0012) at Weeley, Essex, East Dean, Sussex, and Rampton, Cambridgeshire (Elphick 1970, 60-2; Deedes and Walters 1909, 38-40; Tyssen 1915, 42; Raven 1882, 41, 163; 1890, 33). The incidence at Nettleton, Lincolnshire is an error by myself, miscopying North (1886, fig 31) for North (1882, fig 31). This bell does not bear the Bullisden shield (North 1882, 589; Ketteringham 2000, 168). Equally, 7.0016 was also occasionally used by the owner of 3.0013, at Navestock, Downham, South Muskham, and Donhead (Deedes and Walters 1909, 31-4, 345; Cheetham 1916, 3, 32-7; 1928, 91-4; Dawson 1995b, 204; Walters 1929, 76, 275-6).

(3.0018 and 3.0021). Only those of Thomas Lawrence occur in different clusters, 3.0017 in cluster 3 and 3.0022 in cluster 4, in the partition at a similarity of 0.3. As one of the four trademarks allocated to clusters must be misallocated if the clusters relate to groups of marks used by particular founders, the estimated Type A error of this partition is 25%, although obviously this estimate must be treated with extreme caution. Estimates of the Type A error relating to founders' trademarks is shown in Figure 51.

Type B errors, those where the trademarks of different founders appear in the same cluster, can also be estimated using the data in Table 7. For example, in the partition at a similarity of 0.2, 25 founder's marks are allocated to clusters. Six of these must be misallocated if these clusters relate to marks used by single workers, as cluster 7 contains the trademarks of four London founders, cluster 27 two trademarks whose owners are unknown, and cluster 69 the trademarks of Ralph II Heathcote and George Heathcote of Chesterfield, and Thomas Bett of Leicester. The estimated Type B error of this partition is therefore 24%. This estimate is also shown in Figure 51.

In determining the most accurate partition of the analysis for identifying groups of marks used by particular founders, the choice is between the partitions at similarity levels of 0.2 and 0.3. The overall estimate of the accuracy of the partitions is helpful in deciding between these contenders (Fig 52). The overall estimate is the same as that for Type B error, except for the partition at 0.3 where the single misallocation of one of the trademarks of Thomas Lawrence has to be included. This graph shows that we can either choose the partition at 0.3, with a low level of error (6.7%) but only 55% of marks allocated to groups, or the partition at 0.2, with a rather higher degree of error (24%) but more stamps included in clusters (83%).

The choice is an archaeological problem. Whereas in general it may be desirable to elicit as much information from the dataset as possible, is it actually realistic to expect a high proportion of marks to be diagnostic of particular founders when so many can be shown to have passed from worker to worker? Of the 154 stamps which appear on bells which can be allocated to particular founders using the information discussed in Chapter 2, 96 can be shown to have been used by more than one founder (62.3%). This is a minimum figure for reuse, as it is likely that many of the marks only known to have been used on

bells by a single documented founder, were in fact also used on bells by founders who cannot be identified.

If we choose either the partition at a similarity of 0.2 or that at 0.3, will the clusters produced relate in any meaningful way to the groups of marks used by particular bellfounders? The complexities of this relationship can best be illustrated by examining one of these partitions (that at 0.2; Fig 53) in more detail.

Cluster 1 in this partition contains stamps 3.0001 and 3.0002 which have been assigned on iconographic grounds to William Chamberlyn of London, working *c* 1440–74 (see above §2.2.3). It also includes cross 1.0001. This not only occurs on over a hundred bells bearing William's trademarks, but also on many of those bearing that of his son, Richard,[4] on a single bell bearing 3.0009 which has been assigned to Richard Hille,[5] and on two bells bearing the initials "ID" which have been assigned to John Danyell, *c* 1454–60 (see above §2.3.5).[6] Consequently in this cluster we have a stamp which is documented as being used by two different founders, William Chamberlyn and John Danyell, who were at least partially contemporaneous. So, unless William only inherited 1.0001 after 1460 (which does not appear likely as this cross is recorded on over 80% of the bells recorded with his trademarks), there must have been some connection between the contemporary tool-kits of these founders. The capital and minuscule sets in this group are also frequently used by William Chamberlyn (see Appendix 3). The capitals also occur on bells by John Danyell,[7] Bullisden,[8] and Thomas Lawrence,[9] and the minuscules on bells by Richard Hille,[10] John Danyell,[11] and John Kebyll.[12] Again the potential for a relationship between the tool-kits of Danyell and Chamberlyn, or the possibility that a founder inherited stamps mid-way through his career, is highlighted.

[4] Cople and Willington, Bedfordshire (0009 and 0041), Hardmead, Buckinghamshire (0142), St Clements and Landewednack, Cornwall (0322 and 0305), Little Clacton, Essex (1078), Hartley Wespall, Hampshire (1358–9), Smithfield, Middlesex (2312), Twywell, Northamptonshire (2396), Oldbury, Shropshire (2702), Swallowcliffe, Wiltshire (3868), and Birtsmorton, Worcestershire (3902).
[5] Shipton Moyne, Gloucestershire (1277).
[6] Winchester, Hampshire (1436) and Bildeston, Suffolk (3107).
[7] Winchester (Hyde), Hampshire (1436) and Bildeston, Suffolk (3107).
[8] Northill, Bedfordshire (0028).
[9] Margaretting, Essex (1090).
[10] Shipton Moyne, Gloucestershire (1277).
[11] King's College, Cambridge (0211) and Winchester (Hyde), Hampshire (1436).
[12] Stradbroke and Sudbury, Suffolk (3404 and 3417).

Perhaps the clue to the relationship between William and John lies in the way John Danyell appears in the documentary record. The Mundham Books of King's College, Cambridge describe him variously as a "bellfounder" and a "vintner", and the same man appears as a "grocer" in another document (Jones 1961, 153; §2.1.3.5). John seems to have been a merchant dealing in a range of goods, and may have acted as an agent for Chamberlyn. It is likely, however, that he did have some practical connection with founding because bells were cast bearing his initials.

The fact remains, however, that all the stamps in this cluster were used by William Chamberlyn, although this group certainly does not represent his entire 'tool-kit'. Simple inspection of the incidence matrix used for this analysis shows that 27 other stamps are used on bells bearing William's trademarks, 3.0001 and 3.0002, all of which must have been contained in his work box (in fact, including marks which appear only once, William had at least 40 stamps in his tool-kit). This cluster may, however, represent a core group of marks which, used together, are most diagnostic of William's bells.

The interpretation of these clusters of stamps as diagnostic 'minimum tool-kits' may also be valid for a number of clusters which only contain trademarks belonging to a single founder. For example, cluster 2 contains the mark of Richard Chamberlyn, cluster 3 contains the marks of Thomas Lawrence, and cluster 9 contains that of William Culverden (others are shown in Table 7; Fig 53). Other groups, which do not contain trademarks, but contain stamps which are only known to have been used by a single documented founder, may also represent 'minimum tool-kits'. For example, cluster 32 contains marks used by John of Stafford, and cluster 65 is composed of marks used on bells bearing the name of John Tonne (Fig 53).

Turning to cluster 7, however, the interpretation of the clusters as the 'minimum tool-kits' of particular founders has to be abandoned. Marks used by at least three, and probably four, founders occur in this cluster. It contains the trademark which can be attributed to either William Dawe or William Founder (3.0014), and also those of Richard Hille (3.0009) and Johanna Sturdy (3.0010). Shield 3.0086, which on the basis of its popularity may also be a trademark, also occurs in this group.

Capital set 8.0002 and minuscule set 5.0028 are used together on bells by Johanna Hille,[13] John Sturdy,[14] Johanna Sturdy,[15] and John Kebyll.[16] The minuscules appear to have ended up in the hands of William Chamberlyn who used them at Brookland, Kent (1662). Stop 2.0002 was used on a bell by John Sturdy at Adstock, Buckinghamshire (0104) and on three bells bearing "William founder"'s medallion.[17] Crosses 1.0037 and 1.0041 occur frequently together. John Sturdy is known to have used them three times,[18] Johanna used them both on a bell at Langford, Essex (1056), and 1.0041 appears to have passed down to John Kebyll[19] and Richard Chamberlyn.[20] This cluster also contains cross 1.0029 which was used successively by Richard Hille[21] and the Sturdys,[22] stop 2.0107 which was used with his initials by John Sturdy as his foundry badge and later by Thomas Lawrence,[23] and no less than four more sets of capitals. Capital set 8.0001 is used by at least four different London founders: Johanna Hille,[24] John Danyell,[25] William Chamberlyn,[26] and Bullisden,[27] and is also found on a group of bells which must date to after 1413[28] as they bear the royal arms which were quartered in that year. John and Johanna Sturdy used capital set 8.0051,[29] which they inherited from Richard and Johanna Hille[30] and which was subsequently used by John Kebyll[31] and the founder of a bell at Fladbury, Worcestershire, which is dated 1503–57 on the basis of its inscription (3926;

[13] East Preston, Sussex (3545).
[14] Piddlehinton, Dorset (0843) and Little Totham, Essex (1086).
[15] Southwick and Winchester, Hampshire (1410 and 1437).
[16] East Lulworth, Dorset (0780) and Hadleigh, Suffolk (3111).
[17] Bradfield, Essex (0982), Deopham, Norfolk (4432), and Folkington, Sussex (3557).
[18] 1.0037 at Chichester, Sussex (3526) and 1.0041 at Good Easter and Little Totham, Essex (1023 and 1086).
[19] Little Linford, Buckinghamshire (0157).
[20] Denton and Ryarsh, Kent (1691–2 and 1766).
[21] Colchester and East Mersea, Essex (0994 and 1009).
[22] By John at Good Easter, Essex (1023) and by Johanna at Langford, Essex (1056), Southwick, Hampshire (1410), and Stoke D'Abernon, Surrey (3490).
[23] Margretting, Essex (1090).
[24] Manaton, Devon (0634).
[25] Winchester (Hyde), Hampshire (1436) and Bildeston, Suffolk (3107).
[26] Albury, Hertfordshire (1593–4), Brookland, Kent (1662), Thorpe St Peter, Lincolnshire (2251), and Bainton and Fawsley, Northamptonshire (2319 and 2343).
[27] Anstey and Hoddeston, Hertfordshire (1595 and 1615), Grays Thurrock, Mountnessing, and Weeley, Essex (1025, 1098, and 1147), and Wroxall, Warwickshire (3714).
[28] Wingrave, Buckinghamshire (0198), Cranham and Great Easton, Essex (0999 and 1033), and Stopham, Sussex (3605).
[29] John at Adstock, Buckinghamshire (0104), Piddlehinton, Dorset (0843), Good Easter, Essex (1023), Gloucester cathedral (1216), and Chichester, Sussex (3526) and Johanna at Stoke Hamond, Buckinghamshire (0182), Langford and Layer de la Haye, Essex (1056 and 1058), Southwick, Hampshire (1410), Stoke D'Abernon, Surrey (3490), Rotherfield, Sussex (3596), and Ladbroke, Warwickshire (3675).
[30] Colchester, Essex (0994) and East Preston, Sussex (3545).
[31] Chesham Bois and Little Linford, Buckinghamshire (0124 and 0157), Kelvedon Hatch, Essex (1052), and Saxmundham and Sudbury, Suffolk (3360 and 3415).

Table 5). Capitals 8.0055 are known not only on bells by Richard Hille,[32] but also on bells by John Sturdy,[33] John Kebyll,[34] and Thomas Harrys.[35] Finally, capital set 8.0113 was used frequently by "William founder" (see Appendix 3), but later also by John Danyell[36] and William Chamberlyn.[37]

From this information, it seems likely that cluster 7 of this partition represents the diagnostic marks used by a group of closely related founders who were working in London in the first half of the fifteenth century. In addition to the owners of the four trademarks, stamps used by John Sturdy (2.0107) and Johanna Hille (8.0001) are also probably represented, although it should be noted that Johanna's trademark, 3.0008, is not assigned to a cluster at this level of similarity. Consequently, this cluster contains marks used by two married couples, Richard and Johanna Hille whose business probably descended to John and Johanna Sturdy. The trademark of "William founder" is less clearly associated, as the only documented connection between him and the Hille/Sturdy line is that Richard Hille was the sole executor to the will of Alice Dawe, daughter-in-law to William Founder, in 1436 (Stahlschmidt 1887, 25).

In the absence of trademarks it is more difficult to demonstrate that not every mark in a group was in the hands of a single founder, although this also appears to be true of cluster 4 (Fig 53). This contains the foundry shields of Roger Landen of Wokingham, *c* 1448–*c* 59 (3.0018 and 3.0021), which were both later reused by John Saunders of Reading, *c* 1535–58.[38] Shield 3.0018 appears on a bell by William Hazelwood of Reading, *c* 1494-1509, at Hoggeston, Buckinghamshire (0147). It also contains stamps 1.0106, 3.0082, and 5.0033. Where these stamps appear on bells with external information relating to their founder, all bear the initials 'WH' (see Chapter 2, fn 44), and can be attributed to Hazelwood.

[32] Shipton Moyne, Gloucestershire (1277), Cheriton and Staple, Kent (1684 and 1783), Ringshall and Washbrook, Suffolk (3344 and 3436), and East Horsley and Headley, Surrey (3475 and 3479).
[33] Piddlehinton, Dorset (0843).
[34] Croxton, Cambridgeshire (0235) and Levington, Suffolk (3289).
[35] Lillington, Warwickshire (3679).
[36] Great Maplestead, Essex (1039).
[37] Boxford, Suffolk (3109).
[38] Kimpton, Hertfordshire (1616), Waterstock, Oxfordshire (2612), and Findon, Sussex (3552).

All the sets of capitals in this group were also used by Hazelwood.[39] Set 8.0005 was more frequently used by Roger Landen[40] and also occurs on a bell at Dorchester, Oxfordshire (2555) which can be dated to before 1383, when the donor whose name is cast on the bell died (Table 5). Set 8.0008 was also used by John Saunders on a bell at Fulmer, Buckinghamshire (0135) which he cast in partnership with John White, and set 8.0046 appears on a puzzling bell at Radclive, Buckinghamshire (0174). This bears the "William founder" shield (3.0014), but also the initials "KV". There are no known founders with these initials, but it has been suggested that they may stand for William Knight and Vincent Gorroway of Reading who may have been working in partnership in the 1580s (Elphick 1970, 75). If so, the foundry shield may be a facsimile of one which appeared on a bell they recast.

Finally cluster 4 contains two medallions. Device 7.0009 occurs on a group of ten bells by Roger Landen[41] and on a single bell by William Hazelwood.[42] The stamp of the groat which was first struck in 1351, 7.0020 (see above §2.2.1), has a more complicated history. It is used on the early bell at Dorchester, Oxfordshire (2555), and subsequently on a group of over 20 bells by Roger Landen (see Appendix 3). Later it may have migrated to London, where it seems to have been used by William Culverden[43] and Thomas Lawrence.[44] The coins on these bells are specifically recorded as identical, and as 'the groat stamp' (Raven 1869, 6, 16-17; 1882, 42-3, 46-8; Deedes and Walters 1909, 43-4), however it is possible that these marks have been misidentified and are in fact the half-groat previously used by John Sturdy (2.0107), which we have seen is certainly used by Lawrence elsewhere (see above fn23). This possibility must remain only a suspicion without further evidence. Finally, however, the groat stamp is certainly used by John Saunders at Waterstock, Oxfordshire (2612).

[39] all on the bell at Hoggeston, 8.0005 and 8.0046 together at Compton, Hampshire (1343), and 8.0046 additionally on bells at Chearley, Buckinghamshire (0120) and Compton, Farleigh Chamberlyn, and Winchester (St Michael), Hampshire (1343, 1352, and 1443).
[40] Maulden and Salford, Bedfordshire (0025 and 0032), Stanford Dingley and Warfield, Berkshire (0093 and 0099), Fawley, Granborough, and Hughenden, Buckinghamshire (0133, 0136, and 0149), Easton, Hampshire (1348), Hinton-in-the-Hedge, Northamptonshire (2356), Westcote Barton, Oxfordshire (2614), St Catharine's, Somerset (2949), Chiddingfold, Surrey (3472), and Easebourne, Sussex (3540).
[41] Maulden, Bedfordshire (0025), Stanford Dingley, Sulham, and Warfield, Berkshire (0093, 0095, and 0099), Hughenden, Buckinghamshire (0149), Whitchurch and Wield, Hampshire (1431 and 1433), Harpsden and Westcote Barton, Oxfordshire (2567 and 2614), and Easebourne, Sussex (3540).
[42] Hoggeston, Buckinghamshire (0147).
[43] Landbeach, Cambridgeshire (0258) and Takeley, Essex (1132).
[44] Toft, Cambridgeshire (0277).

Consequently all the documented stamps in cluster 4 can be shown to have been in the hands of William Hazelwood, except for 3.0021 which is only known to have been used by Landen and Saunders. This group may therefore not represent the tool-kit of a single founder, although, as Hazelwood lies between Landen and Saunders in the succession of the Wokingham business, it is of course possible that shield 3.0021 was contained within his workbox but he chose not to use it (or that a bell where he did use it has not survived in the sample of his work that remains). This intermittent use of stamps does not seem to have been a frequent occurrence,[45] although the reproduction of ancient inscriptions 'in facsimile' on recast bells became common in the post-medieval period and is sometimes a cause for confusion.

This examination of the partition at a similarity level of 0.2 perhaps suggests that this partition is to be preferred to that at 0.3. This is on the basis that a relatively low level of error (24%) allocates a relatively high proportion of bells to clusters (83%), and yet the groups obtained still seem to be archaeologically meaningful, relating to the most diagnostic 'minimum tool-kits' of a single founder or a small group of closely related founders.

A note of caution should be made, however, as there is some evidence that there may be some association between the incidences of stamps which is not solely related to the 'tool-kit' in which they were found. This is to say that a founder did not choose which stamps to use from his work-box at random. This is most clearly shown by the high level of similarity between the royal head stamps.

In the partition at a similarity level of 0.2 (Fig 53), cluster 37 includes stamps which are documented in use not only by different founders, but by different foundries. Medallions 7.0003 and 7.0004 are used by at least four different founders: William Rofforde of Toddington, Bedfordshire *c* 1390–8,[46] Thomas Derby of King's Lynn, *c* 1450,[47] Thomas

[45] Cross 1.0005 may also be a case of intermittent use. It occurs on more than 50 bells by John Danyell, William Chamberlain, Richard Chamberlyn, and Bullisden (see Appendix 3 and above p115 for the relationship between Danyell and William Chamberlyn), and also on a bell at Hardley, Norfolk (4499) which bears the Brasyer shield. This incidence does not appear to be a recording error, and so it appears that 1.0005 migrated to the Norwich foundry from London. The obvious mechanism for this is Thomas Lawrence who moved to Norwich *c* 1540. However, this hypothesis would mean that the mould for stamp 1.0005 lay unused in the tool-boxes of both William Culverden and Lawrence himself in London before reappearing in Norwich. It would also mean that the Hardley bell must have been cast after the death of Richard Brasyer II in 1513, although the bell at South Bergh, Norfolk (4682; see above §2.4.4) has already demonstrated that the Brasyer shield continued in use by his successors and so this is not impossible.
[46] Westmill, Hertfordshire (1641).

Harrys of London,[48]and Robert Clerke of Lincoln, *c* 1483–*c* 1512.[49] In addition these marks appear on a bell at Bitterley, Shropshire (2655) which must have been cast before 1415 (see above §2.4.1), and one at Stoneleigh, Warwickshire (3700) which was cast during the period 1488–1531 (Table 5). These marks were undoubtedly well traveled and popular with a number of different craftsmen. What is unusual is that they display such a high level of similarity with each other (0.70). This is explained by the iconography of the marks: 7.0003 is the head of a king, usually identified as Edward I, and 7.0004 is that of a queen, his wife Eleanor (North 1878, 64-5). Consequently they are associated as a functional pair, and their high similarity is based on this rather than on their use with other stamps from the same contemporary foundry.

Cross 1.0033 and capitals 8.0052 were used by William Rofforde,[50] Thomas Derby,[51] and the founder of the bell at Bitterley, Shropshire (2655). The cross is also used by Robert Clerke[52] and on a bell at Caldecot, Cambridgeshire (0207) which dates to after 1351 because it bears the impression of a groat which was first struck in that year. The capitals also appear widely: on bells by Thomas Potter of Norwich, 1395-*c*1428,[53] on a bell by the Brasyer foundry of Norwich,[54] and on a bell at Bristol cathedral which must date to before 1486 as it bears the arms of Abbot John Newland who died in that year (1185). This evidence demonstrates that the stamps contained within this group were used by at least six different foundries at various times.

Turning now to the relationship between the clusters of stamps produced by the single-link cluster analysis and foundries, 160 stamps are known from the evidence outlined in Chapter 2 to have been used by identified foundries. Twenty-three stamps are known to have been used by more than one foundry.

First, the accuracy of the different partitions of the single-link cluster analysis of stamps can be assessed in relation to the 35 trademarks or foundry stamps shown in Table 7

[47] Chippenham, Cambridgeshire (0230), and Burnham Deepdale and New Haughton, Norfolk (4412 and 4577).
[48] Lillington, Warwickshire (3679).
[49] Frodingham, Lincolnshire (2050).
[50] Westmill, Hertfordshire (1641).
[51] Chippenham, Cambridgeshire (0230), Burnham Deepdale and New Houghton, Norfolk (4412 and 4577), and Ampton, Suffolk (3084).
[52] Wickersley, Yorkshire (West Riding)(4238).
[53] Eaton, Illington, Norwich St Paul, and Wacton Magna, Norfolk (4450, 4521, 4630, and 4729).
[54] Burnham Overy, Norfolk (4414).

which can be allocated to a centre of production. For example, the partition at a similarity coefficient of 0.3 places trademarks belonging to six foundries in clusters (Bristol, Bury St Edmunds, Chesterfield, Leicester, London, and Norwich). Stamps used by workers in four of these foundries are placed in more than one cluster: those of Bristol in clusters 53 and 54, those of Chesterfield in clusters 76 and 77, those of London in clusters 1–4, 13–14, 18, 21, and ?36, and those of Norwich in clusters 82 and 85. Consequently the Type A error of this partition is 66.7%. In contrast, in no case are stamps from different foundries placed in the same cluster, and so the Type B error of this partition is 0%. These estimates for each partition which has been considered are shown in Figure 54.

An alternative approach to estimating the accuracy of the different partitions of this analysis, is to consider the 160 stamps which are known to have been used by particular foundries from the documentary and iconographic evidence outlined in Chapter 2. Although 23 of these were used by more than one foundry (14.4%), this proportion is not so high as to make the procedure misleading, as was the case with the proportion of documented marks used by more than one founder (62.3%; see above). This process can be illustrated by examination of the partition at a similarity of 0.1 (Fig 55).

One-hundred and fifty eight of these 160 stamps are allocated to clusters at this level of partition, the vast majority (119) appearing in cluster 1. This cluster contains all the marks known to have been used by the Bristol, Bury St Edmunds, Exeter, King's Lynn, Lincoln, Salisbury and Wokingham foundries, along with all 23 marks which are known to have been used by workers from more than one foundry. Marks from three foundries which have other marks appearing in other clusters occur in cluster 1, thus contributing to the estimate of Type A error which considers all of these documented marks.

Fifty-three marks used by the London foundry occur in cluster 1, although another 15 London marks occur in cluster 3. One mark by the Leicester foundry appears in cluster 6, although three others occur in cluster 1. Five marks used by founders based in York appear in this cluster, although another two stamps used by York-based founders appear in cluster 4. An additional contribution to this estimate of Type A error is provided by the Norwich foundry, as a single mark belonging to this workshop appears in cluster 12, in addition to the 16 stamps which appear in cluster 8. Totaling the minimum number of marks which must be misallocated so that all the remaining stamps by a particular foundry appear in the same cluster (19 in this example) and dividing by the number of

documented stamps which are allocated to clusters by a partition (in this case 158), provides an estimate of the Type A error for the partition (12%). This estimate is also shown in Figure 54.

Type B error can be estimated in a similar way. Again using the example of the partition shown in Figure 55, this estimate of Type B error is 44% (Fig 54). This is made up of all but those marks known to have been used in London from cluster 1 (53), the 15 marks used in London from cluster 3, and the single stamp used by Thomas Bett of Leicester which appears in cluster 6 (this cluster is otherwise composed of stamps used by the Chesterfield foundry)(69/158=44%).

Estimates of overall error for the partitions of the single-link clusters analysis of stamps are shown in Figure 56. If the stamps appearing in Table 7 are considered, then this estimate is simply the Type A or Type B error as no partition has errors of both type. Considering the 158 marks which are known to have been used by certain foundries on the basis of documentary evidence (and are allocated to partitions by this analysis), this estimate is provided by calculating the minimum number of stamps which must have been misallocated in order to produce clusters which contain marks of only one foundry. So, for example, for the partition at 0.1 (Fig 55) this is the Type B error already discussed, plus capital set 8.0247 belonging to the Norwich foundry, which appears in clusters 12 (all other documented marks used by this foundry appear in cluster 8). Thus this estimate for the overall error of this partition is 44.3% (70/158).

Figure 56 shows that all possible partitions of the single-link cluster analysis of stamps identify clusters relating to particular foundries relatively poorly. The optimal partition is that at a similarity of 0.1, which allocates 95% of bells to clusters although the overall error is estimated to be 44.3%. This is rather high, but as the only other partition with a lower proportional error rate (that at a similarity of 0.6 with an estimated overall error of 35%) allocates only 19.6% of stamps to clusters, the partition at a similarity level of 0.1 is to be preferred.

3.4.3 Discussion

From the partitions discussed above, it is immediately apparent that single-link cluster analysis of this dataset provides coherent results, which are in reasonably good agreement with the independent documentary and iconographic evidence outlined in Chapter 2.

The estimated overall errors and the proportion of bells or stamps allocated to clusters for each selected partition are shown in Table 8. It can be seen that most of these partitions allocate about 90% of the bells or stamps to clusters, and of these bells or stamps approximately 75% are allocated to clusters consistent with their interpretation as groups of bells or marks relating to particular founders or foundries. The exception is the identification of groups of stamps relating to foundries, where the optimum partition is much less accurate (at only 55.7%).

For both the single-link clusters analysis of bells and for that of stamps, the level of similarity most appropriate for the identification of groups relating to single founders is higher than that required for the identification of groups relating to foundries. This is what would be expected from a hierarchical clustering algorithm.

In the absence of independent evidence, the selection of a meaningful partition would have had to have been based on the cluster analysis itself. For the single-link cluster analysis of bells, the number of clusters formed by each partition peaks at a similarity of 0.7, and then falls steadily until a similarity of 0.3 is reached (Fig 38). Thereafter the decline in the number of clusters formed by each successive partition is much shallower. The largest fall in the number of clusters formed between partitions is that between similarity levels of 0.4 and 0.3, although falls which are almost as big occur between similarity levels of 0.6 and 0.5, and between 0.5 and 0.4. It would be difficult to select the partitions at 0.5 and 0.4 as particularly significant from this data alone.

The selected partitions also do not stand out particularly strongly in the graph which shows the number of bells allocated to clusters in each partition (Fig 39). There is a big increase between the partitions at similarity levels of 0.7 and 0.6, and another substantial increase between 0.6 and 0.5, but thereafter the rate of increase declines, until it become negligible after 0.3. Again it would be difficult to select the partitions at 0.5 and 0.4 from this data, although it is the clusters immediately before the partitions where the number of additional bells allocated to clusters declines sharply that are significant.

Turning to the single-link cluster analysis of stamps, the graph showing the number of clusters formed by each partition is more informative (Fig 49). This shows a fairly steady increase in the number of clusters formed by each partition, until there is a dramatic decrease in the number of clusters produced between the partitions at a similarity of 0.3 and 0.2. From this it might be possible to conclude that the partition at a similarity level of 0.2 is significant. There is only a small decrease in the number of the clusters formed by the partitions at 0.2 and 0.1, however, and so it is not clear that the partition at 0.1 is particularly significant. As this partition defines groups of stamps relating to particular foundries relatively poorly, this is perhaps unsurprising.

The graph showing the number of stamps allocated to clusters by each partition (Fig 49) shows a fairly steady increase in the number of stamps included in clusters until the partition at a similarity of 0.4. Thereafter there is a steeper increase, the sharpest rise again occurring between the partitions at similarity levels of 0.3 and 0.2. A number of additional stamps are allocated to clusters by the partition at 0.1, but this increase is of a similar order to that between the partitions at similarities of 0.3 and 0.2, and so it would be difficult to select this partition in preference to that at 0.3 in the absence of external evidence.

In each case, the partitions of the single-link cluster analyses identified as archaeologically meaningful by means of the documentary evidence are accompanied by large falls in the number of clusters produced by the partition in comparison to the number of clusters produced by the partition at the previous level of similarity. There is also an increase in the number of bells or stamps allocated to clusters by the significant partition, particularly in relation to partitions at the succeeding levels of similarity. Only in one case is the choice of partition clear-cut using these criteria, however—most often a number of potential partitions are identified.

This perhaps reflects reality. In terms of choosing the 'correct' partition, the uncomfortable fact is that there is none, or at least none which is perfect. Interesting and useful information about the data can be elicited from a number of different partitions of the same analysis.

For example, the most complete 'minimum tool-kits' of different founders may be identified at different levels of similarity. That of Richard Hille appears at a similarity of

0.3, consisting of his trademark (3.0009) and two crosses (1.0004 and 1.0107). At the next level of similarity (0.2), these marks are joined by those of at least three other founders (Fig 53, cluster 7; see above). In contrast, the partition at 0.3 puts the two trademarks of Thomas Lawrence into different clusters, which only come together to form his 'minimum tool kit' in the partition at a similarity of 0.2 (Table 7). The case of John Tonne is even more extreme. At the partition at a similarity of 0.5, four clusters form which are composed of stamps only known to have been used by John. These combine into a single cluster at a similarity of 0.3, although marks are added to this group in both subsequent partitions so that the most complete 'minimum tool kit' for John does not appear until the partition at a similarity of 0.1 (Fig 55, cluster 3).

There is also no 'correct' level of partition for the single-link cluster analysis of bells. Table 8 demonstrates that the partition of this analysis at a similarity coefficient of 0.4 provides the most accurate indication of groups of bells cast by particular foundries, with an overall estimated error of 23.7% and almost 95% of bells allocated to groups. In addition to those clusters which can be related to the documentary evidence, other clusters appear to form geographically coherent groups. For example, the distribution of cluster 21 (including all those bells with marks identical to those occurring in the matrix), appears to be centred on Salisbury (Fig 57), and that of cluster 9 to be centred on Nottingham (Fig 58). Both of these foundries are well-known from documentary evidence, although this information cannot be related to particular sets of surviving bells.

This picture is complicated by the distribution of bells in cluster 18 (Fig 59). This seems to fall into two groups, one in Devon and one further north centred around Gloucester. There is a clear gap in the distribution around Bristol and in northern Somerset. By examining the clusters formed at higher levels of similarity, it is apparent that most of the bells in the area around Gloucester appear in cluster 76 of the partition at a similarity coefficient of 0.6, and most of those in Devon appear in cluster 75. Furthermore, some of the bells in this Devon group bear stamp 3.0031, the foundry mark of Robert Norton of Exeter, and a bell at St Nicholas, Gloucester (1220) in the northern group bears the name of 'Robert Hendley'. Two other bells in this group bear the initials 'IS', one at Aston Ingham, Herefordshire (1455) and one at Aldsworth, Gloucestershire (1166).

Examining the stamps which appear on these bells, it is apparent that only cross 1.0096 and the 'cracked M' (8.0112) appear on bells in both clusters 75 and 76 of the partition at

0.6 (Fig 60), appearing together on thirteen bells bearing the mark of Robert Norton in cluster 75,[55] on three bells in cluster 76,[56] and on two which are unallocated by the partition at a similarity of 0.6.[57] Considering the actual levels of similarity used to link bells in the analysis (Fig 61), it appears that there is actually a direct connection between clusters 75 and 76 in the form of the bell at Priston, Somerset (2938) which links with that at Ashbury, Devon (0486) at a similarity of 0.5. This single link 'chains' together two clusters which are otherwise quite separate.

The fact remains, however, that there is a link between these groups of bells represented by the mutual use of stamps 1.0096 and 8.0112. This is perhaps informative of some connection between the business of Robert Norton, and the founder who used these stamps further north. In this instance, 'chaining' may represent real connections within the data, rather than being an artefact of the clustering technique.

As anticipated, this characteristic of single-link cluster analysis means that it has been rather more successful in identifying bells by particular foundries than by particular founders (Table 8). At the optimum partition for identifying groups of bells cast in the same foundry (that at a similarity of 0.4), only one cluster contains bells known to have been cast in different centres of production, although this group (cluster 9) does contain bells by at least nine foundries. However, when attempting to isolate groups of bells by particular founders we have seen that there is a tendency to merge clusters of bells which were made by small groups of closely related craftsmen. For example, cluster 83 (Fig 40) contains bells by Thomas Potter, Richard Baxter, and Richard Brasyer all of whom worked in Norwich in the fifteenth century. Some clusters also contain a few bells by a different founder from the craftsman who cast the majority of those in the group. For example, cluster 2 (Fig 43) contains 32 bells by William Chamberlyn of London, twelve by his son Richard, and one by John Danyell.

In contrast the single-link cluster analysis has been more successful in identifying groups of stamps relating to single founders than groups of stamps relating to foundries (Table 8). These groups, however, certainly do not define the entire ranges of stamps available to

[55] Ashbury (0486-7), Fremington (0572), Knowstone (0617), Meath (0642), Mortehoe (0656), Romansleigh (0681), Seaton (0684), Southleigh (0690), Stockleigh English (0692), Stockleigh Pomeroy (0694), Uplowman (0711), and Whimple (0731), all in Devon.
[56] Horton, Gloucestershire (1238), Priston, Somerset (2938), and Crudwell, Wiltshire (3786).
[57] Brimpsfield, Gloucestershire (1177) and Chilthorne Domer, Somerset (2785).

a craftsman in his work-box. For example, cluster 54 (Fig 53) contains three stamps including the trademark of Robert Clerke of Lincoln, but sixteen different marks are known on bells bearing this shield. It may be that single-link cluster analysis has defined 'minimum work-box' groups, rather than the entire contents of a founder's tool-kit, because the technique identifies non-overlapping clusters. As many stamps were passed on through successive owners of a business, their tool-kits would be expected to overlap significantly.

In the analysis of stamps, chaining appears to lead to a much more dramatic combination of clusters. The first 63 clusters formed by the partition of this analysis at a similarity level of 0.2 (Fig 53) merge into a single cluster at the next level of partition (Fig 55). The linkages which join these groups are many and varied, but it is probably no accident that all 23 stamps which can be shown to have been used by more than one foundry on documentary evidence appear in cluster 1.

The process of chaining can be illustrated in a less dramatic example by examination of cluster 69 of the partition at a similarity coefficient of 0.2 (Fig 53). This group includes the foundry marks of Ralph II Heathcote and George Heathcote of Chesterfield (3.0065 and 3.0036), and of Thomas Bett of Leicester (3.0078). The documentary record demonstrates that George and Thomas were at least partially contemporaneous, but reveals no link between these foundries (although Thomas is known to have married the widows of two other Leicester bellfounders (see §2.2.4.1), and his daughter, Katherine, married a third, Robert Newcombe (see §2.2.4.2). Examining the linkages which form this group (Fig 62), shows that the 'minimum tool-kit' of Bett defined by the partition at 0.3 (cluster 80, Fig 63) is joined to that of George Heathcote (cluster 77, Fig 63) by means of cluster 79 (Fig 63). It is the similarity of the 'fylfot D' (shield 3.0040) with the capitals in this group which links Thomas Bett to the Chesterfield family.

Single-link cluster analysis has been able to accurately identify groups of bells which relate to founders and foundries, although it is rather more successful at defining foundry groups. It has also been able to form meaningful groups of marks which seem to have been used by a single worker. It has been less successful in identifying groups of stamps relating to foundries, although the process by which clusters relating to single craftsmen are combined into large groups may identify links between different worker or foundries (Table 8).

The reasons for the relative effectiveness of the technique in identifying different levels of clusters in the data may be related to the properties of those clusters. Clusters of bells, particularly those relating to foundries, may be serpentine in shape as chronologically successive groups cast by related founders link together by chaining. As almost all bells were cast by a single founder or foundry, these clusters can be expected to be clearly separated. In contrast clusters of stamps, particularly clusters defining the complete tool-boxes of founders, may be more globular in shape and certainly overlap considerably. The general failure of the analysis to identify clusters of this type is masked by its ability to identify smaller 'minimum tool-box' clusters, which do not overlap but again may be globular in shape.

Generally, single-link cluster analysis has provided coherent results for the analysis of this dataset. As expected on theoretical grounds, it is, however, most effective identifying well separated clusters which are serpentine in shape.

3.5 k-means cluster analysis

This is an iterative partitioning method of cluster analysis. The data are initially partitioned into a set (user-defined) number of clusters, and the centroids (or profiles for categorical data) of these clusters computed. Data points are then allocated to the cluster whose centroid is nearest to them using Euclidean distances, and the centroids are then recalculated. The data are reallocated again to the cluster whose centroid is now nearest to them, and the centroids recalculated once more. This process is repeated until no data points change cluster with a new pass through the data (Anderberg 1973). It should be noted that the use of Euclidean distance as a measure on a binary data matrix leads to the (implicit) use of the simple matching coefficient in k-means analysis (Baxter pers comm 2006; Appendix 4). In Euclidean space, the technique attempts to find non-overlapping spherical clusters which are isolated from each other. The algorithm is described by Hartigan (1975, 85-7).

The major advantages of the k-means algorithm are that it can find structure in data which is not hierarchical, and by reallocating entities it takes into account the overall structure of the data. It is also attractive because it maximizes two, intuitively desirable, properties of

clusters: internal homogeneity and external separation. Because clusters do not overlap, and may not be contained within each other, a type or unit can only be a member of one cluster. Also, a unit or type can be so distant from other centroids in the analysis that it forms a cluster in which it is the only member.

The k-means approach does suffer from one major disadvantage, however. This is the difficulty of identifying the optimal partition of the data. Stable partitions may be formed which comprise only locally optimal solutions (cf Hodson 1971, table 1), as the major re-organisation of the cluster structure needed to improve the solution cannot be initiated by the k-means algorithm, which can only consider one unit at a time. As the number of units increases, so the likelihood of finding a true global optimum solution decreases (Doran and Hodson 1975, 182-3). Consequently different starting positions may influence the final partition, although this may not be a problem in practice if the structure in the data is very clear (Bayne *et al* 1980).

A number of different approaches have been suggested to overcome this problem (Everitt 1980, 93-5). Ideally, every possible partition of the dataset into the required number of groups could be calculated and compared. Unfortunately, the number of calculations required to do this (certainly on a dataset of 1289 bells and 509 stamps) makes this process impractical even with the increased computing power available nowadays. Instead, an attempt is made to discover a solution close to the global optimum by comparing a number of locally optimal solutions, provided by starting the analysis from different initial partitions, and selecting the best of these. A variety of algorithms have been suggested to do this (Aldenderfer and Blashfield 1984, 46-8).

The second major difficulty in using k-means cluster analysis is that it is necessary to know how many clusters there are, and for them all to be the same shape (spherical in the case of k-means using Euclidean distances). The technique also has a tendency to produce clusters of approximately the same size, even if such clusters are not present in the data (Scott and Symons 1971).

Sometimes evidence external to the analysis may be available which can suggest an appropriate number of clusters for the partition. Alternatively, a heuristic approach may be adopted where a sharp fall in the homogeneity of the clusters produced by the optimal partition of solutions at successive numbers of clusters may indicate the 'correct' number

of groups in the data. This can be seen as an "elbow" in the graph of the number of clusters against the within groups sum of squares (as a percentage of total sum of squares) (this is commonly known as the "percentage error of fit"). Again, a number of different criteria have been proposed, although many have been shown to be very sensitive to the shape of the clusters formed (Everitt 1980, 99; Whallon 1990; Hodson 1971, 32-3). In general, these are useful only to suggest solutions which may be investigated by further validation techniques (Aldenderfer 1982; Whallon 1990).

Probably the most widely used of these techniques is discriminant analysis, undertaken to "validate" the results of a k-means analysis. This approach tackles the theoretical reservations about the use of Euclidean distance for k-means clustering—for categorical data, that it ignores correlation between attributes. The use of Mahalanobis distances mitigates the effect of correlation, and allows the identification of clusters, which although still non-overlapping, are ellipsoidal in shape. Discriminant analysis has not be applied in this application simply because the results of the k-means analysis compare so poorly with the external standard (see below).

Another potential problem with the use of k-means cluster analysis on binary data is the (implicit) use of the simple matching coefficient for the analysis (see above and Appendix 4). As this association coefficient gives as much weight to the joint absence of stamps as to their joint presence, its use may not be appropriate in this application (see §3.1.3; Doran and Hodson 1975, 136-9). This may be particularly problematic because of the volume of missing data in this incidence matrix (see §1.3.4).

Turning to the data considered in this study, how the expected structure within the dataset fits the k-means model must be considered. First, this can be discussed with reference to the (entirely imaginary) series of founders and foundries described in Figures 21 and 22 (see §1.5). As with single-link cluster analysis, the example of the marks used by Richard I and Richard II demonstrates that overlapping clusters of stamps may be anticipated, and so k-means cluster analysis may not be the optimal technique for the identification of marks relating to individual craftsmen. It may be better at identifying smaller groups of marks forming the 'minimum tool-kit' of individual founders, however, as these clusters

may be spherical[58] (although they are unlikely to be well separated from surrounding marks). As these 'minimum tool-kits' also probably only represent up to a handful of stamps, these clusters may be of similar size. It is unlikely, however, that the full tool-kits of particular founders were necessarily of similar size.[59] This is also a case where joint presence is likely to be of more importance than joint absence, as a stamp might be absent because it was not one of the core set of marks (eg if a founder has more than one set of capitals) rather than because a founder did not possess it.

It is also likely that k-means cluster analysis may not be particularly suitable for the identification of groups of stamps belonging to particular foundries. It can be seen from Figure 22 that these clusters may be elongated in shape. They are also unlikely to be of similar size. Simply on the basis of the documentary evidence, we know, for example, of 50 bellfounders who were working in London between the last decades of the thirteenth century and the Reformation, whereas in Gloucester we know of only 10, and in Exeter of only four. In contrast to the number of marks which are known to have been used by more than one founder (96/154, or 62.3% of documented marks), fewer are known to have been used by more than one foundry (23/160, or 14.6% of documented marks). This may suggest that clusters of marks which relate to foundries overlap less, and are more separated, than those which relate to the tool-kits of specific founders. It should also be noted that, with reference to Figure 21, a hierarchical structure of clusters may be expected in this dataset—a structure which k-means analysis is not designed to uncover.

In contrast, k-means cluster analysis may be more effective at uncovering clusters of bells related to particular founders or foundries. These clusters are expected to be almost entirely non-overlapping, and so the ability of the technique to find well separated clusters may be appropriate for this dataset. The clusters relating to bells by single founders could be at least globular in shape (if not precisely spherical), although again they are unlikely to be of similar size.[60] Clusters of bells cast by the same foundry are neither likely to be of similar size, nor are they likely to be spherical as they probably

[58] Except perhaps in cases where variables are highly correlated on functional grounds (eg the Royal Head marks of Edward III and Philippa of Hainault (7.0001 and 7.0002)), when the clusters are likely not to be spherical (Baxter 1994, 167) and use of Euclidean distances could be problematic.

[59] For example, based on the stamps which occur with their foundry badges, William Culverden (*c* 1497-1522) used at least 18 stamps, but Thomas Bett (1524-39) only 12. We have already seen, however, that William Chamberlyn (*c*1440-74) used at least 40, and 18 appear on bells by William Hazelwood (1494-1509) and 33 on bells by John Sturdy (*c*1440-54).

[60] For example, again based on the occurrence of their foundry badges, 28 surviving bells can be assigned to William Culverden, 11 to Thomas Bett, and 132 to William Chamberlyn.

comprise 'chains' of related clusters belonging to single founders. The hierarchical structure expected of the clusters in this data may not be a problem for k-means analysis. Although such a structure would not be revealed by this analysis, it is not expected that the clusters of bells cast by particular founders will be in a hierarchy, nor that the clusters of bells cast by particular foundries will be in a hierarchy. Rather it is a hierarchy of 'founders clusters' which may constitute 'foundry clusters'.

In general, it seems likely that the k-means model is less appropriate for this dataset than the model of single-link cluster analysis, although the technique may have some success in identifying clusters of stamps relating to the minimum tool-kits of particular founders, and in identifying clusters of bells cast by particular founders.

The k-means cluster analysis was performed on the reduced incidence matrix of 1289 bells and 509 stamps for each cluster solution up to a maximum of 150 clusters (for the analysis of bells) and 100 clusters (for the analysis of stamps)(Hartigan 1975, 85-7). Each cluster in the final partition must contain a minimum of two bells or stamps. The analyses were implemented using the IASTATS module of the Institute of Archaeology package, which utilises the Singleton-Kautz algorithm to obtain an optimal partition (Hodson and Tyers 1988).

3.5.1 Results (clusters of bells)

As it is not a hierarchical method, the results of k-means cluster analysis cannot usefully be expressed as a dendrogram. This is because the analyses for each different number of clusters are independent, and so there is no reason why two bells which belong to the same cluster in the solution with 2 clusters should also be in the same cluster when there are, say, 4 clusters.

A summary of the results, showing cluster membership for only those bells which can be linked with the documentary evidence outlined in Chapter 2, is given in Table 9. The solution for the partitions forming 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, and 150 clusters are given. The analyses were stopped at a maximum of 150 clusters, as this number of clusters is well above the maximum number formed by the single-link cluster analysis of bells (134 in the partition at a similarity level of 0.7: Fig 38). Three further partitions are shown: those forming 14, 58, and 89 clusters. This is because there

is evidence external to this analysis that these partitions may be particularly appropriate for this dataset. The most accurate partition of the single-link cluster analysis of bells in defining clusters relating to founders, that at a similarity level of 0.5 (Table 8), forms 89 clusters, and that for founders (0.4; Table 8) forms 58 clusters. The documentary evidence suggests that there were 14 principal centres of bellfounding in England in the medieval period (Fig 23).

In k-means clustering, each bell is allocated to a cluster (even if that cluster only contains a single bell),[61] and the number of clusters formed is defined by the user. Consequently, an appropriate number of clusters for the dataset either has to be known from evidence external to the analysis or determined from the data. Figure 64 shows the percentage error of fit for k-means cluster analyses of bells forming increasing numbers of clusters. The fit decreases steadily, certainly there is no clear 'elbow' in the graph which might suggest an appropriate partition. This may suggest that this method of analysis is unable to determine clear structure in the data. An assessment of appropriate partitions for the data therefore has to depend on external evidence, an approach frequently unavailable to archaeologists.

In this application, the accuracy of each partition may be assessed by reference to the documentary information outlined in Chapter 2. The accuracy of each partition in relation to the evidence of known founders is shown in Figure 65. Again, two types of error can be found. Type A errors are those of division, where bells known to be by the same founder occur in different clusters. Type B errors are those of conflation, where bells known to be by different founders occur in the same group.

Two methods are available to estimate each type of error. First, for Type A errors, the number of documented founders whose bells appear in more than one cluster can be determined. This is then divided by the number of founders who have more than one identifiable bell in the incidence matrix (35). So, for example, for the partition with 89 clusters, the Type A error of the k-means analysis is 82.9%—since bells by 29 of the 35 founders with more than one identifiable bell in the matrix appear in more than one cluster. Perhaps a more realistic estimate of Type A error is provided by the second method. In this case the minimum number of documented bells which have to be misallocated in order to ensure that bells by a particular founder are allocated to a single

[61] Although refinements of the technique which allow the formation of a 'residue' now exist (Baxter 1994, 148), these have not as yet been utilised by archaeologists.

cluster is calculated (in the case of the partition forming 89 clusters this is 138 bells). This figure is divided by the number of bells in the analysis which can be allocated to particular founders (371), forming an estimate for the Type A error of this partition of 37.2%.

Similar approaches have been adopted for assessing Type B error. In this case all 51 founders with even a single documented bell can be considered. For the partition forming 89 clusters, bells by 44 of these founders fall into clusters containing bells by another documented founder and so the Type B error is 86.3%. Considering the minimum number of bells which must be misallocated if each cluster only contains bells by a single documented founder, then the error of this partition is 21.8% (81/371).

An estimate of the overall error of a partition can be provided by the minimum number of bells which must be misallocated if each cluster only contains bells by a single founder and if bells by each documented founder only occur in one cluster. This estimate is shown in Figure 66. For the partition forming 89 clusters, a minimum of 172 bells must be misallocated to eliminate both Type A and Type B errors, and so the overall estimate of error is 46.4% (172/371).

Figure 66 suggests that the k-means approach has not been able to identify accurately groups of bells cast by particular founders. Generally, the analysis misallocates around half the documented bells, either allocating them to clusters which contain bells by more than one founder, or allocating bells by the same founder to different clusters. The solutions for a number of clusters between 50 and 80 all have overall estimates of error of around 40%. The lowest overall error is provided by the k-means cluster analysis which produces 50 clusters, which misallocates 37.7% of bells.

The accuracy of different partitions can be assessed in a similar manner when considering clusters of bells cast by particular foundries (Figs 67 and 68). These graphs demonstrate that k-means cluster analysis is also unable to identify accurately groups of bells cast in particular centres of production. In all cases a majority of bells are misallocated, assigning bells to clusters which also contain bells cast in different foundries, or allocating bells cast in a single foundry to different clusters. The partition with the lowest overall error (58.9%) is that which forms 14 clusters.

3.5.2 Results (clusters of stamps)

A summary of the results for the k-means cluster analyses of stamps, showing cluster membership for only those stamps which can be linked with the documentary evidence outlined in Chapter 2, is given in Table 10. The solutions for the partitions forming 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 clusters are given. The analyses were stopped at a maximum of 100 clusters, as this number of clusters is well above the maximum number formed by the single-link clusters of stamps (90 in the partition at a similarity level of 0.3; Fig 49).

Two further partitions are shown: those forming 12 and 77 clusters. This is because there is evidence external to this analysis that these partitions may be particularly appropriate for this dataset. The most accurate partition of the single-link cluster analysis in defining clusters of stamps relating to founders, that at a similarity level of 0.2 (Table 8), forms 77 clusters, and that for foundries (0.1; Table 8) forms 12 clusters.

Again the first problem is to determine how many clusters are contained within the data. Figure 69 shows the percentage error of fit for the k-means analyses of stamps forming increasing numbers of clusters. The fit decreases steadily, with no clear 'elbow' in the graph which might suggest an appropriate partition. This may suggest that this method of cluster analysis has been unable to reveal clear structure in the data. The assessment of the relative merits of different partitions therefore has to depend on external evidence, which is not available for many archaeological problems.

Turning once more to the documentary evidence outlined in Chapter 2, the accuracy of each partition has been assessed in relation to known bellfounders and foundries. Two forms of error have been identified—those of division, where stamps known to have been used by the same founder or foundry occur in different clusters (Type A errors), and those of conflation, where stamps known to have been used by different founders or foundries occur in the same group (Type B errors).

In assessing the accuracy of alternative partitions in relation to stamps which can be attributed to founders, the analysis is limited by the small number of trademarks which can be linked to distinct founders (Table 11). Unfortunately only trademarks, which probably did not routinely move between founders, can be considered to be diagnostic of

particular craftsmen as a very high percentage of other documented stamps (62.3%) can be shown to have been in the hands of more than one worker.

The estimate of Type A error in relation to founders is particularly problematic as there are only four founders who have more than one trademark assigned to them. Of these, those of William Chamberlain (3.0001 and 3.0002) and those of Thomas Lawrence (3.0017 and 3.0022) occur together in the same clusters in each partition. For all partitions forming more than 12 clusters, the trademarks of Roger Landen (3.0018 and 3.0021) and T Bullisden (3.0011 and 3.0012) occur in different clusters. As two of the trademarks must be misallocated if the clusters relate to groups of stamps used by particular founders, then the Type A errors of these partitions is 25% (2/8).

Type B errors relating to founders are those which place trademarks used by different founders in the same cluster (Table 11; Fig 70). This type of error decreases steadily until it reaches its lowest level in the solution of the k-means analysis which produces 100 clusters. This estimate of Type B error is 24.1%, as only seven of the 29 trademarks which can be assigned to founders have to be misallocated if the clusters produced relate to the tool-boxes of particular craftsmen.

The overall error of the k-means analysis of stamps is shown in Figure 71. The lowest overall error is also produced by the partition creating 100 clusters, with an overall estimated error of 27.6%. This is made up of the six trademarks which were not used by Thomas Lawrence which are allocated to cluster 1 and one of the stamps by unknown (but separate) workers which fall in cluster 38 (Type B errors), and of one of Roger Landen's marks, which fall in clusters 26 and 100 (Type A error)(Table 11).

The assessment of the accuracy of alternative solutions of the k-means cluster analysis of stamps in relation to marks by documented foundries is more robust, as the reuse of stamps which are not trademarks between different foundries is less widespread than the reuse of such marks by different founders (see above). This means that all 135 stamps which occur on bells by known foundries can be considered (Table 10), providing a much larger sample than the 51 marks which can be considered diagnostic foundry trademarks (Table 11).

Consequently the Type A error of the solutions in relation to foundries can be calculated in two ways (Fig 72). The first considers the 35 stamps from foundries which have more than one trademark (Table 11). This estimate gradually increases, giving a minimum error of 22.9% (8/35 stamps misallocated) for the solutions which produce 10 or 12 clusters. The second method of estimating the Type A error of these analyses produces very similar results. Again the error gradually increases, with the lowest error being 22.2% (30/135 stamps misallocated) for the solution which produces 10 clusters.

The two methods of estimating Type B errors also produce similar results (Fig 72). Considering the 35 trademarks in Table 11, the error gradually reduces with a minimum error of 20% (7/35 stamps misallocated) being produced by the partition which forms 100 clusters. This solution also provides the minimum figure for Type B error when this is estimated using the stamps listed in Table 10, 23.7% (35/135 stamps misallocated).

The results of the two methods of calculating the overall error of the k-means analyses are shown in Figure 73. For all solutions, more than half the stamps must be misallocated in some way if the clusters actually relate to groups of marks used in particular foundries. When considering just the trademarks, the solutions producing 70 and 77 clusters have a minimum error of 60% (21/35 stamps misallocated). Considering the wider selection of stamps listed in Table 10, a minimum overall error of 55.6% (75/135 stamps misallocated) is produced by the solution which forms 10 clusters.

It seems unlikely that k-means cluster analysis has been able to isolate groups of marks which were used by different foundries.

3.5.3 Discussion

Generally k-means cluster analysis has been unable to identify accurately groups of bells which were cast by the same founder or foundry, and has also been unable to identify groups of stamps which were used by particular craftsmen or workshops (Table 12).

The principal reason for the comparative failure of the technique to determine the structure in the data seems to be that it uses an association coefficient (the simple matching coefficient) that is inappropriate to this dataset, because it gives as much weight to joint absences as to joint presences. Given the large number of stamps in the dataset,

relatively few of which were used by any given founder, a joint presence is more important than a joint absence. Joint absences may also simply be an artefact of the substantial amount of data known to missing from the incidence matrix.

Also, k-means cluster analysis is designed to identify spherical clusters, and the actual clusters in the data which relate to founders and foundries seem not to be spherical. This is shown by the large errors in relation to documented foundry groups shown by the k-means clustering of both bells and stamps. In both cases, the clusters are expected to be elongated or serpentine in shape rather than round. In contrast, the partitions relating to documented founders have lower overall errors, and are expected to be more globular in shape.

The fact that k-means cluster analysis identifies non-overlapping groups seems to be less important in its failure to find the clusters relating to founders and foundries. In reality, the clusters of bells are expected to be almost entirely non-overlapping as bells were almost always cast by a single founder and workshop. In contrast, the clusters of stamps are expected to overlap substantially as we can demonstrate from the documentary and iconographic evidence that stamps were frequently used by more than one founder (and less frequently by more than one foundry). However, the overall errors for the chosen partitions of the k-means analyses of bells are worse than those for the chosen partitions of stamps. The accuracy of the partitions is also worse for groups of stamps assessed against the documented foundry evidence than against the documented evidence of founders (even though groups of stamps relating to foundries are expected to overlap less than those relating to bellfounders). This evidence suggest that k-means analysis is more robust against overlapping clusters than against non-spherical ones.

K-means analysis also seems to be relatively robust if the clusters in the data are not all of similar size. For example, in the partition of the bells into 50 clusters the number of bells in each cluster ranges from 309 (cluster 1) to five (cluster 7)(Fig 74), although most include between 10 and 50 bells. However, it is also true that this method has identified clusters of stamps relating to founders more accurately than the other varieties of cluster present in the data, and it is these groups which are thought to be most similar in size, as well as most likely to be spherical. Consequently it is difficult to dismiss the range of sizes of cluster in the data as a factor in the ability of k-means analysis to identify founder and foundry groups.

Even though the technique has not been able to accurately identify groups of bells or stamps relating to particular founders or foundries, the clusters produced by the analysis are by no means random. For example, in the partition of the bells which produces 50 clusters (Table 9), 17 of the 38 clusters which contain documented bells contain bells by a single founder. With the exception of cluster 1, which contains bells cast by at least 32 different founders, the other clusters contain bells by between two and five founders. Usually the bells in these groups are by sets of closely-related founders, for example, cluster 18 contains bells by Richard Hille of London and his wife Johanna (*c.* 1416-41), and cluster 37 contains bells by Ralph Heathcote I of Chesterfield, and his sons Ralph II and George (*c.* 1483-1558). Some founders, however, are represented by more than one cluster. For example, clusters 6 and 13 both contain only documented bells by Roger Landen of Wokingham (*c.* 1448-59), and more of his bells occur in cluster 1.

Some coherence is also visible in the clusters produced by the partition of bells which forms 14 clusters (Fig 75), some at least of which appear to relate to distinct geographical groupings of bells (eg cluster 14 to the Bury St Edmunds foundry, clusters 5 and 10 to the workers in Bristol). This is despite an overall estimated error for this partition in relation to the documentary evidence of foundries of 58.9%!

Finally, however, it must be admitted that even this limited success in isolating groups of bells and stamps which relate to founders and foundries, depends on the independent documentary evidence for the selection of the most appropriate partitions of the data. Without this evidence, which is usually lacking for archaeological applications, there would be no indication of the number of clusters contained within the data. This is the fundamental weakness of this approach to clustering, and it is this weakness, along with the use of an association coefficient which is inappropriate for this application, which make k-means clustering of limited use in the analysis of this dataset.

3.6 Shared near neighbour cluster analysis

The next method to be considered is shared near neighbour cluster analysis. This is a non-parametric approach. For each point in the dataset a (user-defined) number of nearest neighbours are listed, using some measure of similarity (in this case the Jaccard

coefficient). The first entry in each list is the point itself. For each pair of lists, test whether the first entry appears in the other list. If it does, count the number of common index pairs in the two lists. If this exceeds a (use-defined) threshold, then join the first entries in each table into a cluster. The algorithm is described by Jarvis and Patrick (1973). The method of forming the shared near neighbour maximal spanning tree is described by Jarvis (1978).

The method is attractive because it does not look for clusters of a particular shape, indeed it has been specifically designed to deal with "non-globular" clusters, which may not overlap. Because it is the orderings of the similarity values which are used, rather than a metric, the technique is independent of scale and relatively insensitive to changes in the similarity measure used. The results are also not influenced by starting position. The method is also fairly robust against data noise, because it relies on a number of "shared neighbours" rather than a few points. The grouping of a point relies on its context within the incidence matrix.

It is, however, necessary to have some idea of the shape of clusters in the data. This is because the number of shared near neighbours (k) must be user-defined—larger values tend to find more globular clusters, smaller values more elongated ones. It is also necessary for the user to define the number of near neighbours which is sufficient for the purpose of grouping. This threshold is the level at which the dendrogram is cut to produce the clusters. Variations in the threshold for the same number of shared near neighbours (k) will give different hierachical clusterings. For a particular number of shared near neighbours, each unit or type can only belong to one cluster in the partition at a certain threshold (although units or types will belong to different clusters at different thresholds).

Another limitation of the shared near neighbour algorithm is that it does not deal very well with ties, in that the first type or unit with a value will be grouped, potentially in preference to other equally valid types or units which may remain ungrouped.

How the expected structure in the data fits this model can be considered again with reference to the (entirely imaginary) series of founders and foundries described in Figures 21 and 22 (see §1.5). The example of the marks used by Richard I and Richard II demonstrates that overlapping clusters of types may be anticipated, and so shared near neighbour cluster analysis may not be the optimal technique for the identification of

marks relating to individual craftsmen. However, the method may be better at defining groups of trademarks which are distinctive to particular founders. These 'minimum work-box' groups are unlikely to overlap and may be globular in shape. This means that they are more likely to be found in analyses which consider a large number of shared near neighbours (ie large values of k). As shared near neighbour cluster analysis is also designed to deal with non-spherical clusters, it may also be robust against variables which may be highly correlated, because in this case the clusters are likely not to be spherical (Baxter 1994, 167).

Generally, however, this technique may be more appropriate for the identification of clusters relating to foundry groups, since it was specifically designed to handle 'non-globular' clusters. The stamps used by Richard I, Richard II, and Richard III do form an elongated chain of groups, and so such structure in the data may be identified by shared near neighbour cluster analysis. In this case, theoretically it would be more appropriate to consider a small number of shared near neighbours (ie small values of k), as this will reveal chain structures similar to those identified by single-link cluster analysis. The shared near neighbour approach, however, has a theoretical advantage over single-link cluster analysis. This is because it relies on a number of "shared neighbours", rather than a single incidence which may join otherwise entirely dissimilar clusters. Not only should this make the technique more robust against errors in the data (expected to be a significant problem in this application (cf §1.3.4)), but also it may militate against the joining together of different foundry groups which are only partially connected. For example, in Figure 21 the marriage of Johanna to Richard III forms the single connection between what are otherwise entirely separate parallel series.

Shared near neighbour cluster analysis does, however, share with single-link cluster analysis, and indeed other hierarchical clustering techniques, the problem of choosing the level at which to cut the dendrogram to form meaningful groups. In this application it may be possible to choose between alternative partitions by using the independent evidence to validate them. This is not an option in most archaeological applications, however, and so the number of clusters formed and the number of bells/stamps unallocated to clusters must be examined to see whether these statistics indicate an appropriate partition.

This technique may be more successful in identifying clusters of bells rather than stamps, as groups of bells by different founders do not overlap. As each bell was cast by only one founder, the fact that a bell can belong to only one group at each level in the dendrogram is appropriate for this data. The expected hierarchy of clusters relating to founders joining into foundry groups at a higher level, may also mean shared near neighbour cluster analysis is appropriate. Again, the ability of the technique to find non-spherical, elongated, clusters may make it particularly suitable for identifying groups of bells relating to foundries.

Before the shared near neighbour cluster analysis was performed, the reduced incidence matrix of 1289 bells and 509 stamps was separated into five connected groups, which have no shared stamps between them. Group A contains four bells,[62] including one by John de Kirkham of York (*c* 1348-71) at Dacre, Cumberland and one bearing the name "Johannes de Copgrave" at Scawton, Yorkshire (North Riding). Group B also contains four bells,[63] although none can be connected with the documentary record, and groups C and D each contain three bells[64] which are also undocumented. Group E contains all the other bells and stamps, comprising an incidence matrix of 1275 bells and 496 stamps. Shared near neighbour cluster analysis was performed on this matrix using the jaccard similarity coefficient (Jarvis and Patrick 1973). This was implemented using BASP for Windows (v5.4) (Scollar *et al* 1985; Scollar *et al* 1993).

A minimum of two bells or stamps was required for cluster definition, so that the results of the clustering by this technique would be directly comparable with those for the other forms of cluster analysis considered here. This led to a practical problem, as BASP only allows up to 99 clusters (this because it was thought to be unlikely that anyone would be able to interpret very large numbers of clusters, and because of memory limitations imposed by DOS when the program was originally written (Scollar pers comm 2004)). The minimum number of bells or bells required to form a cluster can be increased, although this would not enable direct comparison of the results from this analysis with those from other methods. For this reason, this limit has not been increased for this

[62] Cumrew and Dacre, Cumberland (0359 and 0360), Sproatley, Yorkshire (East Riding)(4084), and Scawton, Yorkshire (North Riding)(4324).
[63] Eggleschiffe and Greystoke, Cumberland (0366 and 0374), Haughton-le-Skerne, County Durham (0933), and Dunsforth, Yorkshire (West Riding)(4160).
[64] Group C: Covenham St Bartholomew, North Somercotes, and Sturton Magna, Lincolnshire (2022, 2153, and 2232); Group D: Barton Hartshorn, Buckinghamshire (0110) and two bells at Newton Purcell, Oxfordshire (2580-1).

application, even though this might be a practical solution to the limitations of the available software if the primary purpose of this study was to reveal structure in the incidence matrix.

3.6.1 Results (clusters of bells)

Shared near neighbour cluster analysis produces a unique dendrogram for each number of neighbours considered in the analysis (k), which may be partitioned into hierarchical clusters by splitting the tree at different thresholds. BASP for Windows, however, allows the consideration of between 2 and 63 shared near neighbours, and so there are 62 possible dendrograms for the clustering of bells. The dendrogram produced by the shared near neighbour analysis of bells, considering 36 neighbours, is shown in Figure 76.

In order to determine which tree might represent the structure in the data most appropriately, the number of clusters produced by each analysis and the number of bells in the residue (ie unallocated to clusters) were considered. Discontinuities in the number of clusters formed by successive partitions, or the number of bells allocated to the residue, might indicate suitable partitions.

The number of clusters formed by successive thresholds, and for successive numbers of shared near neighbours in the analysis (k), is shown in Table 13. A selection of this data (for those values of k considered in detail below) is shown in Figure 77. For all values of k, lower thresholds produce a limited number of clusters until successive thresholds lead to a larger increase in the number of clusters formed by the partitions. This increase seems to occur where the threshold is between half and two-thirds the value of k, but there does not appear to be an abrupt discontinuity which might suggest where precisely the dendrogram should be cut. For all values of k, at higher thresholds the analysis forms more than 100 clusters (and so results are not available). A similar pattern is shown by the number of bells which are not allocated to clusters at successive threshold, and for successive values of k (Table 14; Fig 78).

The accuracy of a selection of partitions was assessed in relation to the documentary and iconographic information presented in Chapter 2.

Shared near neighbour analysis was performed seven times for 2, 12, 22, 32, 42, 52, and 62 near neighbours. These values of k were selected to cover the whole range of cluster shapes which might be included in the data, including larger values to isolate globular clusters (*a priori* considered likely to be appropriate for the identification of clusters relating to founders), and smaller values to isolate elongated clusters (*a priori* considered likely to identify foundry groups). In addition the analysis was performed with the BASP default value of k (the square root of the number of bells = $\sqrt{1275} = 36$), since in many applications this will be used in the absence of any external data which might inform the selection of k.

Each of these eight dendrograms was then partitioned at thresholds of 1, 3, 8, 13, 18, 23, 28, 31, 36, 41, 46, 46, 51, and 61 as appropriate (the threshold must be less than or equal to k). These values were selected to include the program default values for the highest, lowest, and default values of k (k=62, 31; k=36, 18; k=2, 1) and an even spread of values between these thresholds. In all 62 partitions were considered in detail, although 15 of these produced more than 99 clusters and so the results are not available. The other 48 partitions were compared with the documentary evidence.

Two types of error can be found. Type A errors are those of division, where bells known to be by the same founder occur in different clusters, and Type B errors are those of conflation, where bells known to be by different founders occur in the same group.

Two methods are available to estimate each type of error. First, for Type A errors, the number of documented founders whose bells appear in more than one cluster can be determined. This is then divided by the number of founders who have more than one identifiable bell in the incidence matrix (35). So, for example, for the partition at level 13 when k=22, the Type A error of the shared near neighbour cluster analysis is 54%—since bells by 19 of the 35 founders with more than one identifiable bell in the matrix appear in more than one cluster. This estimate of the Type A error of the partitions studied in detail is shown in Table 15.

Perhaps a more realistic estimate of Type A error is provided by the second method. In this case the minimum number of documented bells which have to be misallocated in order to ensure that bells by a particular founder are allocated to a single cluster is calculated (in the case of the partition at level 13 when k=22, this is 52 bells). This figure

is divided by the number of bells in the analysis which can be assigned to particular founders and which have been allocated to clusters by the partition (353). This provides an estimate for the Type A error of this partition of 15%. This estimate of the Type A error of the partitions studied in detail is shown in Table 16.

For all numbers of near neighbours (k) considered in the analysis, the proportion of Type A error increases as the level of the partition increases. As Type A errors are those of division, where bells by the same founder occur in different clusters, this is unsurprising. Cutting the dendrogram at a higher level (ie towards the base; Fig 76) will produce more clusters and so bells by the same founder are more likely to appear in more than one group. Partitions with relatively low levels of Type A error can be found for all values of k.

Similar approaches have been adopted for assessing Type B error, considering all 51 founders with even a single documented bell. For the partition at level 13 when k=22, bells by 42 of these founders fall into clusters which contain bells by another documented founder, and so the Type B error is 82%. Considering the minimum number of bells which must be misallocated if each cluster only contains bells by a single documented founder, then the error of this partition is 26.6% (94/353). These estimates of Type B error for the partitions which have been studied in detail are given in Tables 17 and 18.

For all numbers of near neighbours (k) considered in the analysis, the proportion of Type B error decreases as the level of the partition increases. As Type B errors are those of conflation, where bells by different founders occur in the same cluster, this is also unsurprising. Cutting the dendrogram at a lower level (ie towards the top; Fig 76) will produce fewer, larger clusters, and so bells by different founders are more likely to appear in the same group. In all cases, the lowest level of Type B error occurs at the highest level of partition available for each dendrogram, and it is likely that this error would decrease even further if partitions with more than 99 clusters could be considered. Partitions with relatively low levels of Type B error can be found for all values of k.

An estimate of the overall error of a partition can be provided by the minimum number of bells which must be misallocated if each cluster only contains bells by a single founder and if bells by each documented founder only occur in one cluster. This estimate is shown in Table 19. For the partition at level 13 where k=22, a minimum of 112 bells must be

misallocated to eliminate both Type A and Type B errors, and so the overall estimate of error is 31.7% (112/353).

Shared near neighbour cluster analysis does not always allocate every bell to a cluster, and so it is necessary to take into account the number of bells in this residue as well as the estimate of overall error when considering the utility of a partition. For the partitions considered in detail above, this is plotted in Figure 79. It is apparent that there is no simple relationship between the number of bells unallocated to clusters and the overall error of a partition in relation to the documented founders. The partition at a level of 13 where k=22, leaves 71 bells unallocated (71/1275=5.6%) and has the lowest overall error in relation to founders (31.7%). The other two partitions with overall errors approaching this level are those at a level of 23 where k=32 (34.4%), and at a level of 31 where k=42 (35.1%). In both cases almost twice as many bells are assigned to the residue (154 and 140 respectively).

The accuracy of different partitions can be assessed in a similar manner when considering clusters of bells cast by particular foundries. Type A error again increases consistently as the threshold of the partition increases (Tables 20 and 21), as the formation of a larger number of clusters increases the chance that bells by the same foundry will be placed in different clusters. Type B error decreases in a similar fashion (Tables 22 and 23).

The estimate of the overall error of the partitions, provided by the minimum number of bells which must be misallocated if each cluster only contains bells by a single foundry and if bells by each documented foundry only occur in one cluster, is shown in Table 24. For the partition at level 23 where k=36, a minimum of 182 bells must be misallocated to eliminate both Type A and Type B errors, and so the overall estimate of error is 36.2% (182/503). Table 24 demonstrates that the overall error in relation to foundry groups does not consistently decrease as the threshold of the partition increases (and so the number of clusters formed increases). This means that the performance of this technique in finding groups of bells from particular foundries probably is not compromised by the limitation of the software to determine 99 clusters or fewer.

The partition at level 23 where k=36 has the lowest overall estimate of error in relation to foundries (36.2%) and fails to allocate 50 bells to a cluster (50/518=9.7%). The number of bells in the residue is plotted against the overall estimate of error relating to foundries

in Figure 80. This shows a second partition with a similarly low level of overall error (38.4%), which allocates only 29 bells to the residue (5.6%). This is formed at a threshold of 41, when k=63. Since the increase in the number of bells which are not classified is so small, probably the partition at level 23 where k=36 is to be preferred.

3.6.2 Results (clusters of stamps)

Shared near neighbour cluster analysis of the stamps can also be performed using BASP for Windows, considering between 2 and 63 shared near neighbours. As an example, the dendrogram produced by the shared near neighbour analysis of stamps considering 63 neighbours is shown in Figure 81.

The number of clusters produced by each analysis and the number of stamps in the residue (ie unallocated to clusters) were considered, in an attempt to determine which analysis most closely revealed the structure in the data. Discontinuities in the number of clusters formed by successive partitions, or the number of stamps allocated to the residue, might indicate suitable partitions.

The number of clusters formed by successive thresholds, and for successive numbers of shared near neighbours in the analysis (k), is shown in Table 25. A selection of this data (for those values of k considered in detail below) is shown in Figure 82. For larger values of k, lower thresholds produce a limited number of clusters. More clusters are formed by partitions at higher thresholds, with the maximum number of clusters consistently formed at a threshold of k-4. Although the increase in the number of clusters formed by successive partitions seems to occur where the threshold is between half and two-thirds the value of k, the increase is gradual rather than providing an abrupt discontinuity which might suggest where precisely the dendrogram should be cut. For low numbers of shared near neighbours (k), the rise in the number of clusters begins from lower thresholds. Indeed, the analysis where two near neighbours are considered, is the only one where the lower threshold (1) produces more clusters (>99) than the higher threshold (2, 85). This seems to be because, for all values of k, it is the highest dozen or so thresholds which produce distinct partitions.

A similar pattern is shown by the number of stamps which are allocated to the residue at successive thresholds, and for successive values of k (Table 26; Fig 83). This graph

explains why the number of clusters goes down as the threshold approaches k. The number of stamps allocated to the residue increases steeply for these partitions, as slicing the dendrogram leads to more stamps being isolated as singletons and so not allocated to clusters (see Fig 81).

The accuracy of a selection of partitions was again assessed in relation to the documentary and iconographic information presented in Chapter 2.

Shared near neighbour cluster analysis of stamps was performed seven times for 2, 12, 22, 32, 42, 52, and 63 near neighbours. These values of k were selected to cover the whole range of cluster shapes which might be included in the data, including larger values to isolate globular clusters and smaller values to isolate elongated clusters. In this case the BASP default value of k (the square root of the number of stamps = $\sqrt{496} = 22$), which is likely to be used in many applications where external evidence is missing, had already been selected for analysis.

Each of these seven dendrograms was then partitioned at thresholds of 1, 5, 6, 10, 11, 15, 16, 20, 21, 25, 26, 30, 31, 35, 40, 45, 50, 55, and 60 as appropriate (the threshold must be less than or equal to k). These levels were chosen to include the program default value for each analysis, and an even spread of values between these thresholds. In all 79 partitions were considered in detail, although one of these produced more than 99 clusters and so the results are not available. The other 78 partitions were compared with the documentary evidence.

Turning once more to the documentary evidence outlined in Chapter 2, the accuracy of each partition has been assessed in relation to known bellfounders and foundries. Two forms of error have been identified—those of division, where stamps known to have been used by the same founder or foundry occur in different clusters (Type A errors), and those of conflation, where stamps known to have been used by different founders or foundries occur in the same group (Type B errors).

In assessing the accuracy of alternative partitions in relation to stamps which can be attributed to founders, the analysis is limited by the small number of trademarks which can be linked to distinct founders (Table 11). Unfortunately only trademarks, which probably did not routinely move between founders, can be considered to be diagnostic of

particular craftsmen as a very high percentage of other documented stamps (62.3%) can be shown to have been in the hands of more than one worker.

The estimate of Type A error in relation to founders is particularly problematic as there are only four founders who have more than one trademark assigned to them. Unfortunately all four pairs of stamps either occur together in the same cluster, or together in the residue, or one in a cluster and one in the residue for every partition examined in detail. This means that no Type A error relating to founders can be detected in the analysis.

Type B errors relating to founders are those which place trademarks used by different founders in the same cluster (Tables 11 and 27). This type of error decreases steadily as the level of the threshold increases, but then reaches a minimum before rising again. The lowest level of Type B error relating to founders is seen in the partition at a threshold of 50 where k=52. This estimate of Type B error is 10%, as only one of the 10 trademarks which have been allocated to a cluster by the analysis has to be misallocated if the clusters produced relate to the tool-boxes of particular craftsmen.

As no Type A error relating to founders has been detected, the Type B error in this case is also the overall error (Table 27). As shared near neighbour cluster analysis does not always allocate every stamp to a cluster, it is necessary to take into account the number of stamps in the residue as well as the estimate of overall error when considering the utility of a partition. For the partitions considered in detail above, this is plotted in Figure 84.

It is apparent that there is no simple relationship between the number of bells unallocated to clusters and the overall error of a partition in relation to the documented founders. The partition at a level of 50 where k=52 has the lowest overall error (1/10=10%), but leaves over half the stamps unallocated (280/496=56.4%). Other partitions with low overall errors also leave more than half the stamps unallocated (Fig 84). The partition at a threshold of 60 where k=63 has an overall error of 21.4% (3/14), and leaves 197 stamps ungrouped (39.7%). The low error of this partition may be because it splits the dendrogram into the maximum number of clusters. The partition at a threshold of 16 where k=22 has a rather higher estimate of overall error (7 19; 36.8%), but only leaves 101 stamps in the residue (20.4%).

As the lowest overall error relating to founders was found in the only partition from those studied in detail which formed the maximum number of clusters for the given number of shared nearest neighbours (k), it was decided to examine these partitions for the other selected values of k. The results of this analysis are shown in Table 28. It can be seen that these partitions are similar, forming between 78 and 86 clusters and leaving 185 to 240 stamps in the residue. All have estimates of overall error in the range 16.7% to 23%, the lowest overall error (16.7%) and the lowest number of bells in the residue (185/496=37.3%) being for the partition at a level of 9 when k=12. Although more than a third of stamps are not allocated to clusters, this is not archaeologically unexpected. If these groups represent only those marks which are diagnostic of particular founders, then it should be expected that the majority of marks are not so diagnostic. In fact, we know that of marks which appear on bells which can be attributed to particular founders through the documentary record, almost two thirds (62.3%) were used by more than one worker.

The accuracy of different partitions can be assessed in a similar manner when considering clusters of stamps used by particular foundries, although in this case the assessment is more robust, because the reuse of stamps which are not trademarks between different foundries is less widespread than the reuse of such marks by different founders (see above). This means that all 135 stamps which occur on bells by known foundries can be considered (Table 10), providing a much larger sample than the 51 marks which can be considered to be diagnostic foundry trademarks (Table 11).

Consequently the Type A error of the solutions in relation to foundries can be calculated in two ways. The first considers the 35 stamps from those foundries which have more than one trademark (Table 29). Using this method, no Type A error is recorded for any partition forming fewer than 15 clusters. As more clusters form, this estimate gradually increases, although beyond the partition which forms the maximum number of clusters, it falls again as more stamps are allocated to the residue. The second method of estimating the Type A error of these analyses produces very similar results (Table 30). Those partitions producing fewer than four clusters have no Type A error. This gradually increases, falling once more beyond the partition which forms the maximum number of clusters as bells are allocated to the residue.

The two methods of estimating Type B errors also produce similar results (Tables 31 and 32). Considering the 35 trademarks in Table 11, for each analysis the error gradually

reduces as the level of the partition increases. A number of partitions have no Type B error – in all cases those where the partition allocates a large number of bells to the residue.

The estimates of overall error relating to foundries, produced using either trademarks alone or all stamps which can be allocated to foundries, are shown in Tables 33 and 34. In general the overall error appears to increase, reach a peak, and then fall again as the threshold for partition of particular analyses increases. However, the graph showing the number of bells allocated to the residue in relation to the overall error relating to foundries (using all documented marked used by particular foundries) shows no clear pattern (Fig 85). The minimum overall error using this method of calculation is 39.3% (44/112) where the threshold is 55 and k=63. This is to be preferred to the partition where the threshold level is 11 and k=12, which has an overall error of only 11.1% (1/9) using simply trademarks, as the former estimate is based on a much larger number of marks and so is more robust.

3.6.3 Discussion

The estimates of overall error relating to documented founders and foundries for the most accurate partitions of the shared near neighbour cluster analyses of bells and stamps are shown in Table 35. The technique has been able to allocate roughly two thirds of bells or stamps by particular founders or foundries to clusters which are diagnostic of those workers. The partitions which attempt to form clusters of bells or stamps relating to particular founders are rather more accurate than those relating to particular foundries.

The results in Table 35 are unexpected in a number of ways. First, as shared near neighbour cluster analysis finds non-overlapping clusters, it was expected that the technique might be better at discovering groups within the dataset of bells than within the dataset of stamps. This does not appear to be the case.

Second, it was expected that groups relating to founders would be best recovered using large numbers of near neighbours (k), and that groups relating to foundries would be best found using small numbers of near neighbours (k). This is because, for both bells and stamps, groups relating to founders are thought to be globular in shape (although probably not always spherical) and groups relating to founders are thought to be elongated 'chains'

combining groups of bells or stamps associated with successive founders. On theoretical grounds, considering large numbers of near neighbours (k) was expected to reveal globular clusters within the data, and low numbers of near neighbours (k), elongated ones. However, for both bells and stamps, the most accurate partitions identified for groups relating to founders consider fewer near neighbours than the partitions identified for groups relating to foundries. Either this is because the clusters in the data are not of the anticipated shape, or the method is relatively robust against the number of near neighbours (k) selected for analysis. This suggestion may be supported by the very similar levels of overall error observed for those partitions forming the maximum number of clusters from the analyses of stamps using very different numbers of near neighbours (Table 28).

Table 35 also demonstrates that shared near neighbour cluster analysis has not been particularly effective in identifying groups of bells relating to foundries. This is unexpected as such clusters are expected to be non-overlapping and non-globular in shape, and the technique was specifically designed to reveal groups of this shape. In addition, the use of several near neighbours for the analysis should make the technique more robust against errors in the data matrix and minor interactions between contemporary series of founders from different foundries. This is because bells or stamps are only joined into groups on the basis of their relationships with several other bells or stamps, and so the analysis takes into account the overall structure of the dendrogram when allocating bells or stamps to clusters. In fact, although theoretically shared near neighbour cluster analysis should have several advantages over single-link cluster analysis, generally it does not seem to define clusters of bells in this dataset as accurately (Table 8).

In contrast, the shared near-neighbour cluster analysis of stamps has performed particularly well in identifying groups of marks related to particular founders (Table 35). The most accurate partition identified (that at a level of 9 where k=12) has an estimated error of only 16.7%, ie only three trademarks must be misallocated from the eighteen allocated to clusters at this threshold for each group to relate to stamps used by a particular founder. Just under half of the trademarks are not allocated to clusters by this partition (17.35=48.6%), a rather higher proportion than that for all stamps (185/496=37.3%). Perhaps this means that the interpretation of these groups as "minimum tool-kits" distinctive of particular workers is incorrect, for surely

trademarks—marks which are not reused by successor founders—should be included in such tool-kits. On the other hand, rather more than half the stamps which can be shown from independent evidence to have been in the hands of more than one founder (49/96=51%) are allocated to the residue by this partition, and so these groups may be related to particular workers.

Another possibility is that these groups are formed of functionally related stamps. For example, the four shields of the evangelists occur in cluster 25 (7.0023-6) and the royal heads interpreted as Edward I and Eleanor of Castile (7.0003-4) in cluster 9. Tentative support for this suggestion may be provided by the high proportion of minuscule sets allocated to clusters by the analysis (30/48=62.5%), as some sets of capital and lower case lettering seem to have been designed together for use in mixed gothic inscriptions. The ability of shared near neighbour cluster analysis to identify the non-spherical clusters formed by such correlations may explain why the technique has been particularly successful in this case.

In common with all methods forming hierarchical clusterings, the determination of the level at which to partition the dendrogram into groups is critical for the formation of meaningful clusters. Whereas shared near neighbour cluster analysis appears to be relatively robust against the choice of the number of neighbours to consider, very different solutions are produced by the selection of different thresholds.

As shared near neighbour analysis produces a hierarchy of cluster solutions for a given number of near neighbours (k), theoretically the best partition to determine clusters relating to founders should be lower in the dendrogram (ie at a higher threshold) than the best partition relating to foundries. This is true for all values of k examined in detail during the analysis of bells (Tables 19 and 24), for example where k=63 the most accurate partition relating to foundries occurs at a level of 41, and the most accurate solution relating to founders at a level of 51. It is also true for all but one value of k examined in detail for the partition of stamps (Tables 27 and 34).[65]

[65] where k=22, the most accurate solution identified in relation to founders is at a level of 20, and that for foundries at a level of 21. However, as these levels are very close, and the number of documented stamps considered for calculating the level of error in the partition of founders is very low, this may not be significant.

Other hints towards the choice of an appropriate threshold for the partition of a dendrogram may be derived from discontinuities in the number of clusters formed by successive partitions, or in the number of bells or stamps allocated to the residue by such analyses. These values, for the partitions studied in detail, are shown in Figures 77-8 (for bells) and Figures 82-3 (for stamps).

It can be seen that, for the analyses of both bells and stamps, the number of bells allocated to the residue for each value of k rises exponentially as the threshold of the partition increases. There are no obvious discontinuities in the graphs which might hint at suitable levels for partition, although this data is still of practical significance as a partition which allocates a large number of bells or stamps to the residue may not be informative.

Figure 82 is more informative, as a clear peak in the number of clusters formed is apparent for each value of k selected for detailed study. It should also be noted that the utility of the partitions producing the maximum number of clusters for different values of k is confirmed by the low overall error produced by these solutions (Tables 27-8). Indeed from the representative range of thresholds and number of near neighbours originally considered for stamps, the lowest overall error is provided by the only partition to produce the maximum number of clusters for its k value (Table 27; where the threshold is 60 and k=63). Unfortunately no clear peak in the number of clusters formed is apparent in Figure 77, although this graph strongly resembles Figure 82. It is possible that no peak appears in the graph because more than 99 clusters are formed by partitions at higher thresholds, and so the results are not available from BASP for Windows (v5.4). If this is so, then it is probable that the technique is able to produce a more accurate clustering of bells in relation to founders than is apparent from the analyses presented here.

Shared near neighbour cluster analysis appears to be able to identify coherent groups of stamps (and possibly bells) relating to particular founders. In this analysis, the results are robust against the choice of the number of near neighbours to be considered, and an appropriate level for partition of the dendrogram seems to be indicated by a peak in the number of clusters formed by partitions at successive thresholds. The technique has been less successful at identifying clusters which relate to foundry groups, and no discontinuities have been observed which might point to appropriate thresholds for useful partitioning of the data in relation to foundries. In all cases, the default threshold values suggested by the software have been too low to provide useful partitions of the data.

3.7 Summary

The most accurate partitions for each of the three methods of cluster analysis discussed in this chapter are shown in Table 36. Overall accuracy has been assessed by comparing the partitions provided by each analysis against the standard known from the documentary and iconographic sources described in Chapter 2.

Single-link cluster analysis has proven most effective for the isolation of clusters of bells relating to founders and foundries, with the partition at a similarity coefficient of 0.5 producing the lowest overall error (29%) in relation to founders, and that at a similarity coefficient of 0.4 the lowest overall error (23.7%) in relation to foundries. Shared near-neighbour cluster analysis provides the most accurate partitions revealing clusters of stamps relating to founders and foundries. The partition at a threshold of nine (when k=12) has an overall error of 16.7% when assessed in relation to documented founders, and that at a threshold of 55 (when k=63) has an overall error of 39% in respect of foundries.

Further discussion of the classification of these data is provided in Chapter 5, but first the results of an alternative, graphical, approach must be presented.

CHAPTER 4

THE EXPERIMENT – CLASSIFICATION AND ORDINATION (CORRESPONDENCE ANALYSIS)

Classification, the process of grouping units which are similar on the basis of their attributes, has been introduced in the previous chapter. This chapter does consider the grouping of bells and stamps into clusters relating to particular founders or foundries, but also considers the ordination of the units and types. As for classification, there are numerous potential orderings for any given set of data. Since archaeology is fundamentally concerned with the fourth dimension—time, however, ordination is often equated with the recovery of a relative chronology of units or types from the incidence matrix. Nonetheless, caution in the interpretation of a relative order as a relative chronology always should be exercised, since there are many other interpretations of an ordering which might be superior for a particular application.

With reference to this dataset, because each bell was cast at a specific point in time, a chronological ordering of bells does, in reality, exist. Since more than one bell-foundry was operating in England at any one time, there may in fact be parallel sequences of bells from contemporary foundries (Bayliss and Orton 1988). In contrast, each stamp in the dataset was used for a period of time. This is measured by a number of incidences when stamps appear at different points in time on different bells. In general it appears that each stamp came into use, and was then used for a period of time before it was lost, discarded, or broken. It is only rarely that a period of intermittent use seems to have occurred (see above, Chapter 3, fn 45).

Correspondence analysis is fundamentally a method of data reduction, which allows the relationships between the variables in a large table to be mapped as points in a space of few dimensions. Since the early 1980s it has been widely used in archaeology, particularly in Continental Europe, in the search for chronological ordering among data (eg Madsen 1988; Jørgensen 1992; Jensen and Nielsen 1997; Müller and Zimmermann 1997). Less frequently it has been used to reveal other sources of variation in data, including the clustering of site types with finds and material types (Barclay *et al* 1990, figs 6 and 12; Müller 1996), site types with coin assemblages (Lockyear 2000), sites with finds types and bone species (Cool and Baxter 1995; Orton 1996), and geographical trends (Holm-Olsen 1988; Cool and Baxter 1999, fig 9).

A general description of correspondence analysis is presented below (§4.1) as part of the discussion of its strengths and weaknesses for the description of this dataset. Detailed mathematical definitions are not given, however, as these are easily available elsewhere. The basic source for correspondence analysis in English is Greenacre (1984), with useful comparatively non-technical summaries provided by Baxter (1994, chapters 5 and 6) and Greenacre (1994). The archaeological literature is dominated by applications of correspondence analysis to investigate chronological variation in data, and so the range of applications presented in Greenacre (1993), Greenacre and Blasius (1994), Blasius and Greenacre (1998), and Clausen (1998) has been useful in understanding the use of the technique to reveal grouping.

All analyses have been undertaken on the reduced matrix of 1289 bells and 509 stamps, using BASP for Windows (v5.4) (Scollar *et al* 1985; Scollar *et al* 1993).

4.1 Correspondence analysis

Correspondence analysis differs fundamentally from the other techniques applied in this study. It describes the relationships between categorical variables in large tables, mapping associations between rows and columns graphically as points in a space of few dimensions. Categories which have similar distributions will be represented by points that are close together, those which are dissimilar will be far apart. There are no mathematically explicit criteria for the formation of clusters, which are defined by visual inspection of the maps. An ordering of the data is also obtained by observing the relative positions of bells or stamps in the map, often along a parabola of data shown on a two-dimensional map.

Correspondence analysis is based on vector and matrix algebra. The data matrix can be considered by row or by column. The first step is to calculate the row profiles or column profiles for each row or column in the incidence matrix. These provide mathematical vectors which enable each point to be represented in space. The relative importance of each row or column is then calculated, the row mass being the average column profile, and the column mass the average row profile. Effectively this prevents frequently occurring units or types from having a disproportionate influence on the analysis. The weighted mean of all the row and column profiles is then calculated. This is the centroid which is the origin of the co-ordinate system used for the analysis.

The second step in correspondence analysis to calculate the chi-squared distance between each pair of rows and each pair of columns. The chi-squared distance is used because it is a weighted Euclidean distance, ensuring that categories with few observations contribute relatively more to the inter-point distances than those with more observations (Greenacre 1994, 11).

Finally, the analysis maps the calculated chi-squared distances as accurately as possible in two dimensions, by finding the axes in the multidimensional space which lie closest to all the points. This is done by principal components analysis of the transformed matrix (Baxter 1994, chapter 3). In addition to the two-dimensional map of the incidence matrix, the total inertia is calculated. This is a measure of the extent to which points are spread around the centroid (up to a total of the number of rows –1 or the number of columns –1, whichever is less). For each dimension (axis) eigenvalues are calculated, along with the proportion of the total inertia explained by that axis. These values provide an indication of the proportion of the variation in the original incidence matrix which has been displayed on a particular map.

Three further diagnostic statistics are provided by correspondence analysis that can aid the interpretation of a map. First, the "contribution of points to dimensions" ("absolute contributions") is the proportion of the inertia of a particular dimension explained by a particular point—units or types with high values are important in defining the axis under consideration. Second, the "contribution of dimensions to points" ("squared correlations") is the proportion of the inertia of a particular point explained by a particular dimension—units or types with high values are strongly associated with the axis under consideration. Finally, a related statistic expresses the goodness of fit of each point's representation in the solution. This is the sum of the squared correlations and is know as the quality of a point. Collectively, these measures are known as the decomposition of the chi-squared statistic.

One further aspect of correspondence analysis demands discussion. This is the ability of the technique to provide maps which display both rows and columns simultaneously, despite the fact that the analysis of rows will produce a different solution from the analysis of columns, and the points occupy different spaces. Both solutions, however, do have the same number of dimensions and the same eigenvalues, and are intimately related

as the row points can be calculated on the basis of the row profiles and the co-ordinates of the column points, and vice versa. These correspondences enable the column space to be stretched in each dimension to fit over the row space, allowing both to be mapped together. It is important to realise that, however useful this property of correspondence analysis, it is only the distances between each set of points that are defined by the analysis (ie distances between units or distances between types). Distances between points from each set are not defined explicitly (ie distances between bells and stamps), and so it is only legitimate to interpret a point in relation to all the points of the other set.

A full description of correspondence analysis is provided by Greenacre (1984), with a less technical summary provided by Greenacre (1994). Comparatively simple step-by-step guides for applied researchers are provided by Greenacre (1993) and Clausen (1998).

Correspondence analysis is attractive for the visualisation of the variation in the incidence matrix of bells and stamps, because it is good at handling large datasets and is considered particularly appropriate for discrete data (because of the use of the chi-squared metric). It enables the maximum amount of variation in the matrix to be displayed in two dimensions. It also gives equal weighting to each bell or stamp, because of the definition of row/column profiles and their mass. By examining the shape of the profiles rather than their size, however, types which occur infrequently are given relatively more weight. Since it is the incidence of a stamp in a founder's tool-kit, rather than how often he chose to use it, which is of significance, these properties of correspondence analysis may be appropriate for this dataset. Finally, the ability of the technique to display bells and stamps on the same map may enable certain stamps to be associated with certain workers (on the basis of documentary evidence relating to bells), and vice versa.

There are, however, a number of drawbacks in the use of correspondence analysis for understanding this dataset. For classification, the most serious of these is the absence of explicit criteria for cluster definition. Visual separation of clusters in the maps may be more, or less, clear-cut. It will become apparent from the results presented below that, although the precise boundaries of some clusters are obvious, those of others are certainly not. Indeed, sometimes the very existence of a cluster may lie in the eye of the beholder! Where to draw the line is both an interpretative decision, and subjective. For this reason, correspondence analysis is very useful for displaying, or confirming, known structure in the data, but may be less effective at discovering new grouping. The existence of the large

body of external information discussed in Chapter 2 should be helpful in interpreting the maps produced by the analysis.

Another drawback in the use of correspondence analysis is the need to determine how many dimensions (axes) can be interpreted meaningfully. There are a number of approaches to this problem. First, the scree test plots the eigenvalues (or proportion of inertia) by increasing dimensionality. This results in a falling curve. If this falls at first steeply and then flattens off, an appropriate dimensionality may be indicated by the point where the curve shows a bend ("elbow")(Clausen 1998, 24-5). A second approach is to exclude any axis which explains less inertia than the average carried by a dimension in the original matrix. As the total inertia always reaches 100%, this average is 100/(minimum of the number of row and columns, minus one)(Blasius 1994, 29).

Two other criteria are also suggested for determining the number of dimensions to be considered. These are interpretability and reproducibility. Interpretability simply means that if a plausible interpretation for the existence of an axis in the data can be suggested, then it is probably valid to do so. On the other hand, if a plausible interpretation cannot be found then perhaps the map simply reflects random fluctuations in the data. An examination of the "absolute contributions" may be helpful in highlighting units or types which are particularly important in the definition of the axis under consideration. Reproducibility is when the analysis of two sets of data (for example, sub-sets) produce similar solutions with the same dimensionality. Such consistency may imply that the axes suggested are meaningful.

Another factor in the use of correspondence analysis for the understanding of this dataset is its vulnerability to extreme profiles (outliers). In this case, the outlying points often occupy a position on the graph far from the other points, which are thus pressed closer together. This may obscure structure in the main body of the data. It also means that the first axis has been defined principally on the basis of outliers. As all subsequent axes have to be orthogonal to the first, this may have an undesirable effect on the overall analysis. Such outliers can either be treated as supplementary points, which do not contribute to the definition of the axes but are mapped, or can be removed entirely from the analysis and treated separately.

Finally, mention should be made of the horseshoe effect often observed in correspondence analysis. Different interpretations exist for this phenomenon, although in many cases it occurs when the first dimension predominates and the second become a quadratic transformation of the first. In these cases, it appears that only the first dimension requires interpretation. It is important to note that this effect is well known, and occurs in multi-dimensional scaling as well as correspondence analysis. It also occurs frequently in non-archaeological applications of correspondence analysis. Nevertheless, the production of a "neat horseshoe" appears to be the holy grail of almost all applications of correspondence analysis discussed in the archaeological literature (a few honourable exceptions are referenced above, p157).

This is both an advantage and a disadvantage of the technique. It is undoubtedly true that the first axis of a correspondence analysis often does relate to relative chronology, and that determining chronology is a major research objective of much archaeological endeavour. On the other hand, the production of a horseshoe most certainly does not guarantee a chronological interpretation of the first axis. In some applications, the obsessive hunt for the horseshoe also leads to the selective omission of units or types until the desired horseshoe effect emerges. Potentially this process runs the risk of imposing the expected chronological structure on the data rather than revealing it.

In this context the use of detrended correspondence analysis should be considered. This approach attempts to deal with the perceived demerits of the horseshoe effect—that it reflects a systematic relationship between the first two axes, and that the scale is compressed at either end of the horseshoe. In archaeological terms this equates with the recovery of a relative, rather than an absolute, chronological sequence (Baxter 1994, 120). Unfortunately, the methods developed for 'detrending the horseshoe' have been criticised as being 'rather arbitrary' and for introducing spurious detail into the results (Baxter 2003, 139). The approach adopted by BASP for Windows (v5.4) is also poorly documented. For these reasons, detrended correspondence analysis has not been applied in this study.

Correspondence analysis is frequently described as a model-free technique. Although there are no assumptions about the underlying distributions of the data, there are a few 'structures' imposed on the data which can be viewed as assumptions. These relate to the equal weighting of row and columns produced by the use of row and column profiles, and

the increased weighting given to relatively infrequently occurring types by the use of the chi-squared distance (see above). Since it is the incidence of a stamp in a founder's tool-kit, rather than how often he chose to use it, which is of significance in this application, these properties of correspondence analysis may not be problematic for the understanding of this dataset.

Beyond this, as correspondence is a descriptive technique, it is not appropriate to compare our expectations of the structure in the data matrix with a technique-specific model. How the expected structure in the data might be reflected in the correspondence analysis maps may be considered, however. This can be done with reference to the (entirely imaginary) series of founders and foundries described in Figures 21 and 22 (see §1.5).

Figure 21 shows that two contemporary groups of marks were used by Foundries A and B. It may be expected that these would be separated into clusters by the analysis, perhaps confounding any chronological trend in the data produced by the succession of stamps between workers in the same foundry. As most foundries were based in different towns, such clusters would relate to the geographical separation of production centres. Some foundries may be separated less well, if they have marks in common (such as capital set Y, which transfers from Foundry B to Foundry A on the marriage of Johanna, daughter of William II, to Richard III).

Once this geographical variation has been revealed, the analysis of each foundry group might be expected to produce maps showing the chronological succession between related founders. These maps might well demonstrate the horseshoe effect so often seen where the first axis relates to chronology. However, the additional variation relating to bells by different craftsmen may confuse the chronological signal on these maps, producing separated groups of bells relating to specific workers.

Considering stamps, the maps may be expected to be rather different and perhaps rather more confused. Each bell was cast by a particular founder at a particular point in time, and so there is a relative (if unknown) sequence of bells in the dataset, and real (but unknown) groups of bells cast by particular foundries and craftsmen. The situation for stamps is rather more complex since, although each stamp was introduced at a particular point in time, each will have been used for a period of time. This period of use may have lasted for a few years or several centuries, and may have related to a single craftsman

working in one location or many workers founding in different places. For example, in Figure 22 capital set C is only used by Richard I from Foundry A, but capital set A is used by all three workers from Foundry A, and capital set Y is used by William I and William II from Foundry B, and by Richard III from Foundry A.

Again some geographical separation of stamps used in different production centres may be anticipated, as may chronological sequences of stamps. The separation between groups and the chronological trends may be less clear-cut in this case, however. This may be caused by particularly long-lived stamps.

Some explanation is required of the way in which correspondence analysis has been used to map the variation in this application. In all cases, simple two-way correspondence analysis was performed using BASP for Windows (v5.4) (Scollar *et al* 1985; Scollar *et al* 1993). The maps of bells have been inspected and grouped independently of the maps of stamps. This is because the partitions produced by the visual inspection of these maps are not identical (although they do have strong similarities; see §4.4 below).

The approach adopted is known as 'peeling', as groups of data which form clusters are removed from an analysis and analysed separately (Djindjian 1985, 126; Cool and Baxter 1999). This has been done for two reasons. First, many of the analyses are dominated by the segregation of relatively small groups of bells or stamps which are only weakly related to the main group of data. It is undesirable that the first axis should be defined on the basis of such outliers, as this will mask structure which is of interest in the main group and all further axes must be orthogonal to the first.

The second reason is pragmatic, as BASP only allows the calculation of a limited number of axes (14). In most applications, this would be more than enough, but the complete (reduced) incidence matrix considered here contains 1289 rows and 509 columns. This means that the analysis is trying to map the variation described by 508 dimensions in the original matrix onto very many times fewer. This problem is demonstrated by the correspondence analysis of the complete reduced incidence matrix (the first two axes of this analysis (for bells) are shown in Figure 86). Each of the fourteen axes calculated by this analysis describe 0.7% of the total inertia, and all fourteen together only describe 9.5%. Patently, more than 14 axes are required to describe the variation in this data matrix adequately.

Clusters of bells or stamps have been identified and separated for further analysis as follows. Correspondence analysis was undertaken on the complete reduced incidence matrix of 1289 bells and 509 stamps. This identified five groups for further analysis (see above §3.7.1 and §3.7.2). Correspondence analysis was then performed on these five groups. Four of them produced maps in which no further variation could be discerned, but the fifth analysis separated the remaining bells and stamps into two clear groups. The smaller of these was removed, and the remaining data re-analysed. Further groups formed, were removed, and the analysis repeated on the residual matrix until the entire dataset was (provisionally) partitioned. Each of the groups formed by this first pass through the data was similarly analysed, with new groups being identified, removed, and the analysis repeated on the remaining matrix.

The analysis was considered complete when no further groups were separated by further analyses, when almost all the inertia of a dataset was explained by the first two axes of the correspondence analysis, or where the resultant map formed either a horseshoe or a single clump in which further variation could not be discerned. The identification of partitions in the data and the definition of the shapes formed by points was undertaken by visual inspection of the maps.

4.2 Results (clusters of bells)

Correspondence analysis was undertaken on the complete reduced incidence matrix of 1289 bells and 509 stamps. A summary of the clusters formed by 'peeling' away groups of bells and successive correspondence analysis of the remaining data is provided in Figure 87.

Five well-segregated groups appear in the map of the first two dimensions (Fig 86), although only 9.5% of the total inertia in the data matrix is accounted for by the fourteen dimensions of this analysis. These five clusters are identical to the five connected groups, which have no shared stamps between them, isolated before shared near neighbour cluster analysis was undertaken (see above §3.6). Cluster A contains four bells, including one by John Kirkham of York and one bearing the name "Johannes de Copgrave" (see Chapter 3, fn 62). Cluster B also contains four bells, and clusters C and D contain three each

(Chapter 3, fn 63-4). The bells in clusters B, C, and D cannot be related to the documentary record. The vast majority of the data are grouped in cluster E which contains 1275 bells and 496 stamps.

Although the first two axes of this analysis each only account of 0.7% of the total inertia, more than 99% of the inertia of each of these dimensions is explained by bells in clusters A-D. Bells in cluster C account for 67.7% of the absolute contribution to the first dimension, with smaller contributions accounted for by clusters A and B (12.9% each). The second dimension is largely explained by the contrast between bells in cluster B (78.4%) and those in clusters C (13%) and D (8%).

Separate correspondence analyses were then undertaken on each of the five groups identified in the previous analysis. Two dimensions are sufficient to explain the total inertia in clusters A-D. In each of these maps (eg Fig 88) the bells are spread evenly around the axes, suggesting that no further meaningful sub-grouping can be identified in these matrices. The correspondence analysis of cluster E again fails to explain the variation in the incidence matrix adequately, with only 9.5% of the total inertia being accounted for by the first fourteen dimensions. Two further groups are, however, well separated in the map of the first two axes (Fig 89).

Cluster 1 contains six bells,[1] including one at Milwich, Staffordshire bearing the name "Johannes de Colsale" and the date "1409". Cluster 2 contains nine bells.[2] Those at Grimley and Worcester (St Michael), Worcestershire are inscribed respectively with the dates "1482" and "1480". The bell at Wichenford, Worcestershire was cast in the time of Thomas Feld, a vicar of the parish who died in 1489 (Table 5). Bells in these two clusters account for the majority of the inertia on the second axis, with bells in cluster 1 accounting for 68.5% and those in cluster 2 for 17.0%. These groups account for a smaller proportion of the inertia relating to the first dimension (10.7% and 6.6% respectively). Figure 89 shows that the remaining bells from cluster E are spread along this axis, following what appears to be a geographical progression—from Bury St Edmunds (red), and through Norwich (purple), King's Lynn (black), Lincoln (blue), Salisbury (dark green), Exeter (brown), Bristol (light green), to London (yellow) and

[1] Sutton-on-the-Hill, Derbyshire (0466), Grayingham, Lincolnshire (2059), Milwich, Staffordshire (3064), and Kellington, Rylstone, and Skelbrooke, Yorkshire (West Riding)(4175, 4203, and 4209).
[2] Church Preen and Ness Magna, Shropshire (2659 and 2700), and Claines, Droitwich, Flyford Flavel, Grimley, Oddingley, Wichenford, and Worcester (St Michael), Worcestershire (3909, 3916, 3927, 3929, 3955, 3975, and 3978).

Wokingham (pink). Further along the first axis, but also curving towards negative values on the second axis come bells documented as cast by founders based in Leicester (dark brown) and Chesterfield (light blue).

The maps of the first two dimensions of the correspondence analyses of clusters 1 and 2 are shown in Figures 90 and 91. Two dimensions are sufficient to explain the total inertia in cluster 1,[3] although again the bells are spread evenly around the axes suggesting that no further meaningful sub-grouping can be identified in this data. Of the total inertia of the cluster 2 matrix, 62.6% is mapped on the first two axes (Fig 91) forming a rather uneven parabola. This may relate to a chronological progression within the group, consistent with the limited number of independently dated bells present.

Figure 92 shows the map of the first two dimensions of the correspondence analysis of the remainder of cluster E, once clusters 1 and 2 have been removed (Fig 87). Again this analysis does not adequate map the variation amongst the data, as the first fourteen axes account of only 9.6% of the total inertia. Clusters 3 and 4 are segregated on the basis of the second dimension, as bells in these groups account respectively for 10.4% and 26.5% of the inertia on this axis. The first dimension is dominated by the difference between bells from the Bury St Edmunds (red) and Norwich (purple) foundries, and the rest.

Cluster 3 contains 21 bells.[4] Thirteen of these have the name of John Tonne cast on them. Four bells have absolute dates cast on them. The bell at Downe, Kent (1696) is dated 1511, that at Sullington, Sussex is dated 1529 (3608), and bells bearing John's name at Botolph's, Sussex (3518) and Stansted Mountfichet, Essex (1126) are dated 1536 and 1540 respectively.

The first two dimensions of the correspondence analysis of cluster 3 are shown in Figure 93. These axes explain 42.8% of the overall inertia, with 12 axes being required to explain all the variation in the data matrix. A graph showing the proportion of inertia explained by each of these axes is given in Figure 94, although no convincing "elbow"

[3] the bells at Rylstone, West Yorkshire (4203) is not included in this analysis, as it only shares a single stamp (3.0075) with other bells in this group.
[4] Balsham and West Wratting, Cambridgeshire (0200 and 0280), Aythorpe Roothing, Belchamp Otten, Hempstead, Littlebury, Little Easton, and Stanstead Mountfichet, Essex (0969, 0974, 1046, 1076, 1079, and 1126), Arreton, Isle of Wight (1316), Tangley, Hampshire (1415), Downe, Kent (1696), and Beddingham, Botolph's, Findon, Keymer, Lewer, Rotherfield, Sullington, and Twineham, Sussex (3512, 3517-8, 3553, 3571, 3576, 3597, 3608, and 3611-12). A second bell at Belchamp Otten (0975=0974), a third bell at

appears which might suggest the number of dimensions which should be considered. Figure 93 suggests that three bells on the right hand side of the map, showing strong association with the second axis, might be outliers. Removal of these bells, however, does not change this map significantly. Consideration of the first and third axes does produce a horseshoe, however, although this is rather unconvincing and on neither map is a chronological progression shown that is entirely consistent with the independent dating evidence. As bells bearing John Tonne's name occur across these maps, it appears that there is no further grouping in the data.

Cluster 4 contains 13 bells,[5] none of which can be associated with the documentary record. The first two axes of the correspondence analysis of this cluster are shown in Figure 95, forming a clear horseshoe. In the absence of independent information of founder or date, the significance of this map cannot be assessed.

Figure 96 shows the map of the first two dimensions of the correspondence analysis of the remainder of cluster E, once clusters 1-4 have been removed (Fig 87). Again, this analysis does not adequately map the variation amongst the data, as the first fourteen axes account for only 10.1% of the total inertia. The bells on this map do form an approximate horseshoe, although this variation is geographical. Bells from the Bury St Edmunds and Norwich foundries are segregated by the first axis, whilst a group of bells from northern England define the second. Although these bells are clearly separated from the main body of the data, it is not always obvious where the boundary of a cluster should be drawn. This is particularly true for cluster 7, as there are several places further down axis 2 where a division could reasonably be made. There are also several sub-groups apparent in the data (circled in Fig 96). Should these be isolated as distinct clusters? Indeed, should the sub-group assigned to cluster 6, really be part of cluster 5? These difficulties illustrate the subjectivity of the visual approach to cluster definition adopted here.

Nonetheless, using the partitions identified in Figure 96, 51 bells have been assigned to cluster 5.[6] Of these 37 bear varieties of the Bury St Edmunds foundry shield (3.0089 and

Botolph's (3519=3518), and a bell at Little Wrattling, Suffolk (3298=0280) also bear the name of John Tonne.

[5] Batcombe, Haselbury Bryan, Melcombe Bingham, Shaftesbury, Shapwick, Stower Provost, and Tarrant Hinton, Dorset (0748, 0802, 0825-6, 0851, 0854, 0864-5, and 0875-6), and Charlton Musgrove and Compton Paunceford, Somerset (2776 and 2800-1).

[6] Carleton, Cheveley, Conington, Coton, Isleham, Snailwell, and Wicken, Cambridgeshire (0223, 0228, 0231 and 0233, 0234, 0254, 0270, and 0281), Alphamstone, Ashdon, Gestingthorpe, Great Chesterford, Great Horkesley, Radwinter, Tendring, Tollesbury, and Wickham St Paul's, Essex (0958, 0963, 1022, 1031,

3.0090), one, the tenor at Redenhall, Norfolk (4653=3169) can be attributed to Thomas Chirche as it was cast in 1514 (see §2.4.4 above), and one, at Canterbury, Kent (St Mary Bredin)(1676=1675) is dated 1505 (Table 2). The first two axes of the correspondence analysis of cluster 5 are shown in Figure 97.[7] Cluster 5a is clearly identified in the first dimension, as these five bells[8] account for 94.1% of the inertia on this axis. Peeling off the cluster, the first two dimensions of the correspondence analysis of cluster 5b are shown in Figure 98. This map does not provide a strong representation of the variation within this cluster as these axes account for only 27.3% of the inertia, and fourteen dimensions are required to map 99.2% of the total inertia. The interpretation of this analysis is not obvious. No further sub-groups are clearly identified in any of the dimensions.

The partition suggested in Figure 96 allocates 134 bells to cluster 6 (Fig 87). A number of workers are represented in this group, most of whom worked in the city of Norwich. The correspondence analysis of cluster 6 does not provide a full description of the variation in this data, as the first fourteen dimensions describe 69.8% of the inertia. A number of sub-groups are clearly apparent in the map of the first two dimensions, however (Fig 99), with the bells in cluster 6a accounting for 95.8% of the inertia in the first dimension, and bells in clusters 6b and 6c for 80.2% and 6.5% of the second dimension respectively.

Cluster 6a contains four bells,[9] one of which is inscribed with the name "Thomas de Wald" (4012). When all the bells bearing his name (see §2.1.6) and those bearing these marks are mapped (Fig 100), it is apparent that he was working in Yorkshire and the north Midlands.

1037-8, 1110, 1133, 1140, and 1153), Canterbury (St Mary Bredin) and Hoath, Kent (1675 and 1717), Newton Bromswold, Northamptonshire (2368), Lessingham, Mundham, Needham, Norwich (St Michael Coslany), Rockland Tofts, and South Lopham, Norfolk, (4539, 4572, 4576, 4624, and 4684), and Badley, Barton Mills, Bradfield, Charsfield, Darsham, Dennington, Denston, Eyke, Fakenham, Holton, Ipswich (St Helen), Ipswich (St Lawrence), Little Bealings, Market Weston, Monkseleigh, Offton, Shelley, Stanton, Tostock, Westhorpe, and Wilby, Suffolk (3091, 3102-3, 3112, 3147, 3148, 3164, 3165, 3169, 3183, 3185, 3242, 3261, 3262, 3291, 3299, 3318, 3323, 3363, 3390-1, 3423-4, 3442, and 3453).

[7] Fifty bells are included in this analysis as that at Isleham, Cambridgeshire (0254) possesses only one of the marks in this group.

[8] Canterbury (St Mary Bredin) and Hoath, Kent (1675 and 1717) and Lessingham, Mundham, and Norwich (St Michael Coslany), Norfolk (4539, 4572, and 4624).

[9] Bretby and Newton Solney, Derbyshire (0420 and 0447), Bitchfield, Lincolnshire (1989), and Bielby, Yorkshire (East Riding)(4012).

Cluster 6b contains 10 bells,[10] none of which can be tied into the documentary record. It is equivalent to the circled sub-group within Cluster 6 tentatively identified in Figure 96. Correspondence analysis of this group does not reveal any further divisions in the data (Fig 101). This cluster may correspond to the bells of a single craftsman who worked in East Anglia and Kent (Fig 102).

Cluster 6c contains seven bells.[11] Examining Figure 96, the isolated bell mid-way between clusters 6b and 6c has been allocated to this cluster rather than 6b on the basis of the association of this bell with this group in the third axis of the correspondence analysis (not shown). No further sub-division of this group is apparent from further analysis. Cluster 6c includes a bell at Harston, Cambridgeshire (0247) bearing the inscription "AWS TEN BRA C KER MAD ME" (reversed)(another bell with the same stamps bears this inscription at Newton, Cambridgeshire (0265=0247)). Austen Bracker has not yet been traced in the documentary record, although he is likely to be a post-Reformation successor to the Brasyer business in Norwich, as bells in this group at Stratton and Newton by Castleacre, Norfolk (4548 and 4578) bear varieties of the Brasyer shield, and a bell at Islington, Norfolk, which bears the same cross and lettering as those in this group, is dated 1556 (see §2.1.11).

Cluster 6d contains 113 bells,[12] of which 60 were certainly cast in Norwich as they either bear the arms of that city (3.0094) or the Brasyer shield (3.0091-3), or they can be

[10] Bridge, Canterbury (St Dunstan), Canterbury (St Peter), Patrixbourne, and Postling, Kent (1659, 1671, 1682, 1758, and 1762), Raveningham, Norfolk (4652), and Athelington, Easton, Frostenden, and South Elmham (St George), Suffolk (3087, 3178, 3200, and 3375).

[11] Harston, Cambridgeshire (0247), Alphamstone, Essex (0959), Catthorpe, Leicestershire (1880), Long Stratton and Newton by Castleacre, Norfolk (4548 and 4578), and Easton and Little Cornard, Suffolk (3177 and 3292).

[12] Kennett, and Landwade, Cambridgeshire (0256, and 0259), Repton, Derbyshire (0454-5), Thorncombe (Forde Abbey), Dorset (0877), Gosfield, Essex (1024), Alburgh, Anmer, Ashby, Ashmanhaugh, Banham, Barton Broom, Bedingham, Breccles Magna, Brockdish, Brooke, Burnham Norton, Carbrooke, Colton, Cromer, Earsham, Eaton, Erpingham, Feltwell, Forncett St Mary, Frettenham, Fritton, Fundenhall, Geldeston, Great Plumstead, Hackford near Hingham, Hardley, Hempstead by Happisburgh, Hickling, Hingham, Ketteringham, Larling, Lessingham, Monk's Toft, Mundham, Narford, North Burlingham, Norwich (The Holy Trinity), Norwich (St Giles), Norwich (St John Sepulchre), Norwich (St Paul), Norwich (St Peter Permountergate), Norwich (St Swithun), Poringland, Salle, Tharston, Thurton, Wacton Magna, and Weston Longville, Norfolk (4359-60, 4363, 4364, 4365, 4368, 4376, 4379, 4400, 4405, 4407, 4413, 4417-18, 4422, 4427, 4443, 4450-1, 4457, 4458, 4463, 4468, 4470-1, 4472, 4484, 4487-8, 4494, 4499, 4512, 4517, 4518-19, 4532, 4536, 4541, 4566-7, 4573-4, 4575, 4582-4, 4590, 4591 and 4593, 4607, 4617, 4630, 4636, 4641-2, 4644, 4672, 4711, 4717, and 4729 and 4742-3), and Ampton, Badwell Ash, Barnby, Barningham, Barsham, Bildeston, Boxford, Bradwell, Brampton, Combs, Cransford, Cratfield, Cretingham, Dalham, Dennington, Earl Stonham, Eye, Fressingfield, Friston, Great Glemham, Hepworth, Hoxne, Icklingham, Ipswich (St Lawrence), Kirkley, Layham, Market Weston, Marlesford, Metfield, Pettaugh, Petristree, Rishangles, Somerleyton, Stowlangtoft, Ufford, and Uggeshall, Suffolk (3083, 3092, 3097, 3098, 3101, 3108, 3110, 3114-6, 3120, 3150, 3156-7, 3158, 3159, 3162, 3166, 3174-5, 3181, 3196, 3197, 3212-13, 3231, 3248-9, 3251, 3265-6, 3278, 3288, 3301, 3302-3, 3312, 3331, 3335, 3347, 3369 and 3371, 3401, 3432, and 3433).

securely attributed to a known founder who appears in the city records. This group contains bells by at least six craftsmen. The former tenor bell at St John de Sepulchre, Norwich (4617) is inscribed "Has Campanas Tu Formasti Pottere Thomas", and bears the three-legged pot (7.0019). This allows this bell, and the other ten bells in this group bearing 7.0019, to be attributed to Thomas Potter, casting *c* 1395 – *c* 1428. Three bells associated with this group have the name "Ricardus Baxter" cast upon them.[13] He was working in Norwich *c* 1416-70. Three bells can be attributed to the two Richard Brasyers (working 1424-82 and 1478-1513). The third bell at St Peter Permountergate, Norwich (4636) is inscribed "Ricus Brasyer Fecit Me" and may be by either man. A bell at Norwich cathedral with the Brasyer shield (4593) bears an injunction to pray for the soul of Robert Brethenam, a monk of the community who died in 1469, and so probably dates to shortly after then whilst the Brasyer foundry was in the hands of Richard I. Finally, another bell with the Brasyer shield, at Cratfield, Suffolk (3158), bears an injunction to pray for the soul of William Aleys who probably died in 1498, suggesting that the bell was probably cast under the direction of Richard II. A slight complication is introduced by two bells at Mundham, Norfolk (4573-4) which bear the ligatured initials of John Baly (*c* 1479-1503; 7.0095) along with the Brasyer shield. He is recorded as working with Richard II in 1488 at East Dereham, and may not have been an independent worker. Finally, a bell at South Bergh, Norfolk (4682=4422) appears to have been cast in response to a bequest in 1522, and so must be by a successor of Richard Brasyer II (see above §2.1.4, §2.2.4.6, and §2.4.4 for full details of these bells and founders).

The first fourteen dimensions of the correspondence analysis of cluster 6d account for 81.9% of the inertia in the data. The proportion of inertia explained by each axis decreases steadily (Fig 103), rather than forming a clear "elbow" which might suggest an appropriate number of dimensions for interpretation. The first two axes only account for 21.1% of this inertia (Fig 104), with the third accounting for 8.2% (Fig 105). No further sub-divisions are apparent from inspection of any of the axes of this analysis, although a general chronological trend is apparently associated with the first axis. This is most clearly seen in the map of axes 1 and 3 which forms an uneven parabola. The bells which can be dated by their inscriptions do fall roughly in chronological order along this axis, although in both maps the bell at Cratfield, Suffolk (3158) appears rather earlier than expected as does one of the bells from Mundham, Norfolk (4573) by John Baly.

[13] Fundenhall (4472), Ketteringham (4532), and Trimmingham (4725=4532), Norfolk.

Returning to the division of cluster E, the final group clearly apparent in Figure 96 is cluster 7, containing 55 bells (Fig 87). The first fourteen dimensions of the correspondence analysis[14] of this group account for 80.6% of the total inertia. The first three axes clearly identify three further clusters, with bells in cluster 7a accounting for 77.0% of the inertia on the first axis, bells in cluster 7b accounting for 60.2% of the inertia on the second axis, and cluster 7c accounting for 63.4% of the inertia on the third axis (Figs 106 and 107).

Cluster 7a[15] contains nine bells by an unknown founder who was working in the mid-fifteenth century, as the bells at South Somercotes are dated 1423 (2217-18), one of those at Somerby is dated 1431 (and both bear the name of Sir Thomas Cumberworth who died in 1450; 2204=2203), and that at Carlton in Lindrick bears the name of William Chambers who was rector of the parish in 1417-43 (2453). Correspondence of this group[16] does not reveal any further sub-grouping (Fig 108), and may provide a map consistent with the independent chronological information.

Cluster 7b contains eight bells.[17] Those at West Halton, Lincolnshire (2280=2111) and York (Micklegate)(4113) bear the name of John Potter, who worked in York 1359-*c* 1380 (§2.1.6), that at Warmfield, Yorkshire (West Riding; 4233=4170) bears the name of John de Berdesay who was Abbot of Kirkstall in 1392-9, and those at Goldsbrough, Yorkshire (West Riding; 4169=4153) and Thirsk, Yorkshire (North Riding; 4346) are dated 1407 and 1410 respectively. It has been suggested (R Clouston pers comm; Greenwood 1995, 162), that these dated bells may not be by John but by a successor. There is no suggestion of this sub-grouping in the correspondence analysis of this cluster, however (Fig 109), although if these bells were cast by him, John had a long career.

Cluster 7c contains 11 bells,[18] which cannot be related to the documentary record. The map of bells in the first two dimensions of the correspondence analysis of this group (Fig

[14] this includes 54 bells, as that at West Bridgeford, Nottinghamshire (2527) contains only one of the marks contained in this group.
[15] Beesby, Hainton, Somerby, South Somercotes, and Toynton St Peter, Lincolnshire (1980, 2074, 2203, 2217-18, and 2256), Cor Colston and Carlton in Lindrick, Nottinghamshire (2452 and 2453), and Wales, Yorkshire (West Riding)(4229).
[16] including eight bells, as that at Haxey, Lincolnshire (2085) contains only one of the marks contained in this group.
[17] Thorpe, Derbyshire (0471), Immingham, Killingholme, and Whitton, Lincolnshire (2105, 2111, and 2282), York (Micklegate), Yorkshire (East Riding)(4113), Thirsk, Yorkshire (North Riding)(4346) and Cold Coniston-with-Kilnsey and Hemsworth, Yorkshire (West Riding)(4153 and 4170).
[18] Heighington, Sedgefield, and Whitburn, Co Durham (0934-5, 0949 and 0951), Springthorpe, Lincolnshire (2221), Newcastle upon Tyne, Northumberland (2432-3), Clarborough, Nottinghamshire

110) forms an approximate horseshoe. In the absence of independent information relating to these bells, the chronological significance of this map remains unknown.

The correspondence analysis of the remaining bells and stamps from cluster 7, once clusters 7a-7c have been peeled away,[19] is show in Figure 111 (Fig 87). This map enables the matrix to be partitioned into two further groups. Cluster 7d contains three bells[20] which cannot be related to the documentary record. Cluster 7e contains 22 bells,[21] including one at Spondon, Derbyshire (0463) which bears the shield of Thomas Newcombe II of Leicester (working 1557-80) and has been included in this dataset in error, and one at Welham, Leicestershire (1947) which must date to after 1422 because it bears three groats of Henry VI. No further sub-grouping is identified by the correspondence analysis of either cluster 7d or cluster 7e.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-7 have been peeled away[22] are shown in Figure 112 (Fig 87). The first fourteen dimensions of this analysis still account for only 12.2% of the total inertia, but two clusters are clearly identified by this map.

Cluster 8 consists of seven bells,[23] which account for 85.6% of the total inertia of the second dimension. Three of the bells in this group bear the name of John of York, a founder who is otherwise undocumented (see §2.1.11). Further correspondence analysis of cluster 8 reveals no further sub-divisions in this data.

The 44 bells in cluster 9 account for just over half the inertia of the first axis of Figure 112 (51.4%). Correspondence analysis of this group segregates cluster 9a clearly from the

(2454), York (Bishopshill Junior), Yorkshire (East Riding: 4121), and Church Fenton and Penistone, Yorkshire (West Riding: 4177 and 4197).

[19] the bell at East Kirkby, Lincolnshire (2037) is also excluded at this stage as it bears only one of the remaining marks in this group.

[20] Hacconby, Lincolnshire (2071) and Hawton and Screveton, Nottinghamshire (2474 and 2505).

[21] Blackwell, Chaddesden, Kirk Halam, Kniveton, Long Eaton, Mugginton, Norbury, and Spondon, Derbyshire (0418, 0422, 0435, 0436, 0437, 0445, 0448, and 0463), Sawtry and Stilton, Huntingdonshire (1857 and 1860), Aldingham and Bolton-le-Sands, Lancashire (1803 and 1805), Welham, Leicestershire (1947), Great Gonnerby, Haxey, and Toynton St Peter, Lincolnshire (2060, 2085, and 2255), Barnwell St Andrew and Stanion, Northamptonshire (2321 and 2390), Cotgrave, Nottinghamshire (2457), Bramshall, Staffordshire (3040), and Barnburgh and Kirk Smeaton, Yorkshire (West Riding: 4136 and 4178).

[22] Five further bells, not belonging to clusters 5-7 are removed at this stage as they bear only one of the types remaining in this dataset—these are bells at Twyford, Derbyshire (0475), Finchingfield, Essex (1016), Weyhill, Hampshire (1429), Laceby, Lincolnshire (2114), and Barrowden, Rutland (2621).

[23] The three bells at Cambridge (St Mary the Great), Cambridgeshire (0222), Sproxton, Leicestershire (1934), and Billing, Northamptonshire (2350=1873) bear the name of John of York. The other bells in this

remaining bells in the matrix (cluster 9b) (Figs 87 and 113). The eight bells in cluster 9a[24] account for 71.2% of the total inertia of the first axis in this analysis. Three bells associated with this group can be related to the documentary record, those at Leicester (All Saints) and Scawby, Lincolnshire bear the name of John de Stafford (1910 and 2190=1871), and that at Coventry (St John the Baptist) can be dated to the period 1360-91 on the basis of its inscription (3660=3636; Table 5). John de Stafford was a prominent citizen of Leicester, working 1338-85 (see §2.1.5). Correspondence analysis of cluster 9a forms a neat parabola (Fig 114), although in the absence of further independent dating evidence the significance of this map is unknown.

Cluster 9b contains 36 bells, which form a convincing horseshoe in the first two axes of the correspondence analysis of this cluster (Fig 115). Despite this parabola, the variation displayed in this map does not appear to be primarily chronological. Figure 116 shows clearly that the first dimension discriminates between bells cast by the Heathcote family (cluster 9d[25]), and those cast by a related, but undocumented group (cluster 9c[26]). Indeed a close-up of the portion of this map relating to bells by the Heathcote founders shows that they do not fall in chronological order (Fig 115, inset).

Only one bell in cluster 9c can be related to the independent documentary evidence, that at South Normanton, Derbyshire (0462) which bears 3.0028, the mark of Ralph II and George Heathcote working in partnership in the years shortly before 1525. Analysis of this group produces a reasonable parabola (Fig 117), although the significance of this map cannot be assessed in the absence of further documented bells.

Of the 20 bells in cluster 9d, 15 bear marks which can be attributed to founders of the Heathcote family of Chesterfield. Two bear the mark of Ralph Heathcote I who was

group are at Billesdon, Birstall, and Wanlip, Leicestershire (1872, 1873, and 1944), and Rolleston and Sutton Bonnington, Nottinghamshire (2498 and 2516).

[24] Morley and Trusley, Derbyshire (0442-3 and 0474), Ayleston and Beeby, Leicestershire (1868 and 1871), Attenborough, Nottinghamshire (2443), Baswich, Staffordshire (3035), and Atherstone, Warwickshire (3636).

[25] Baslow, Beeley, Shirley, and, Derbyshire (0415, 0416-17, and 0461), Belleau, Bishop Norton, and Scothorne, Lincolnshire (1981, 1987, and 2192), Mansfield Woodhouse, Normanton-on-Trent, and Wellow, Nottinghamshire (2482, 2493, and 4766), Ellastone, Staffordshire (3047), and Ackworth, Bolton-on-Dearne, Cantley, Cawthorne, Hootton Pagnell, Owston, and Silkstone (West Riding)(4128, 4142-3, 4148, 4152, 4172, 4193 and 4789, and 4208).

[26] Dacre, Cumberland (0361), South Normanton, Derbyshire (0462), Pittington, Co Durham (0942-3), Dalton, Lancashire (1815), Bonby and Horkstow, Lincolnshire (1992 and 2095), Maplebeck, Nottinghamshire (2485), Musgrave, Westmorland (3739), Abberley, Worcestershire (3894), Bentham, Cawood, Hootton Roberts, Leathley, Pateley Bridge, and Thrybergh, Yorkshire (West Riding)(4139, 4150, 4174, 4181, 4195, and 4225).

working *c*1483-1502 (3.0025), four the mark of Ralph Heathcote II who was working 1510-25 (3.0065), and eight the mark of George Heathcote who was working *c*1525-58 (3.0036). Another bell bears stamp 3.0028 which may be attributed to Ralph II and George working in partnership in the years shortly before 1525. Full details of the documentary evidence relating to this group of craftsmen are given in Chapter 2 (§2.2.4.3). The first two axes of the correspondence analysis of cluster 9d are shown in Figure 118. The bells form an untidy parabola which show perfect correspondence with the chronology of the bells known from the iconographic and documentary evidence.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-9 have been peeled away are shown in Figure 119 (see also Fig 87). The first fourteen dimensions of this analysis still account for only 13.0% of the total inertia, and it is also by no means clear where to partition this map. Axis 1 appears to distinguish between bells cast in London (yellow) and Wokingham (pink) from those cast in Bristol (green), Exeter (light brown), and Lincoln (blue). Axis 2 distinguishes bells from the Wokingham foundry from those from London, and bells from Lincoln (and an unknown related group) from those from the South West. In both cases, however, there is no clear separation between groups. Rather, there is simply a greater density of bells in some parts of the map. The boundary defining cluster 10 has been drawn through the clearest gap in the spread of points, although it is doubtful whether precisely this group would have been identified in the absence of external information. The existence of cluster 10 is supported, however, by examination of axes 2 and 3 of this analysis (not shown).

It may be worth noting at this point that several further axes of this analysis appear to confirm the validity of groups, which are peeled away later in the process of dividing cluster E. For example, axes 3 and 4 segregate a group of bells which will become cluster 12, axes 5 and 6 separate groups which will become clusters 14 and 15, and axis 8 appears to isolate cluster 16. This reproducibility provides an internal check to the validity of the classification proposed from the correspondence analysis.

The first two dimensions of the correspondence analysis of cluster 10, mapping 20.5% of the inertia in this matrix, are shown in Figure 120. The 92 bells in this cluster[27] form a

[27] Two of these bells, those at Landbeach, Cambridgeshire (0258) by William Culverden of London (1497 – 1523) and at Toft, Cambridgeshire (0277) by his successor Thomas Lawrence (1522-45; see §2.2.3) only carry one of the stamps in this cluster, and so are removed before further analysis. The other bells in this

neat parabola, although this is demonstrably not a chronological sequence. Towards the negative end of the first axis occur seven bells by William Hazlewood of Reading (1494-1509; see §2.3.2). Twenty-seven bells bearing one of the varieties of Roger Landen's trademark (3.0018 and 3.0021) and 38 bearing the groat stamp (7.0020), which must date after 1351 when the groat upon which it was modelled was first struck, occur close to the centroid. Roger Landen was working in Wokingham between *c* 1448 and *c* 1459 (see §2.2.4.4). One of the bells bearing the groat stamp, that at Dorchester, Oxfordshire (2555), must have been cast before 18 June 1383 as it bears the name of Ralph Rostwold who died on that date (Table 5). Towards the positive end of the first axis, however, occur four bells with the initials 'is' in gothic minuscules which have been attributed to John Saunders of Reading (1535-58; see §2.3.3). A bell at Fulmer, Buckinghamshire (0135) which was probably cast by John White and John Saunders in partnership in the early 1540s, as it bears the initials 'isW', is also on this side of the graph (see §2.3.4). Even further towards the positive end of the first axis occurs a group of 13 bells which bear the arms of Chertsey Abbey (3.0019). Two of these bells are dated; one at Easebourne, Sussex (0097=3541) was purchased in accordance to the will of Sir David Owen (died 1520-30; §2.4.4); a second at Aldbourne, Wiltshire (3751) is cast with the date '1516' in Roman numerals (Table 2).

If the horseshoe provided by this analysis is partitioned as shown in Figure 120, then three clusters are formed. Cluster 10a includes the bells by William Hazelwood. Further correspondence analysis of this group maps 75.5% of the total inertia in the data in the first two dimensions, forming another parabola (not shown). Cluster 10b includes the four bells attributed to John Saunders and those bearing the arms of Chertsey Abbey, although

group are at Carlton, Chalgrave, Maulden, and Salford, Bedfordshire (0005, 0006, 0025, and 0032), Appleford, Aston Tirrold, Aston Upthorpe, Chilton, Combe, Denchworth, Drayton, Fawley, Hurley, North Moreton, Ruscombe, Sparsholt, Stanford Dingley, Sulham, Tidmarsh, Warfield, and Woolhampton, Berkshire (0048-9, 0051, 0053, 0058, 0060, 0062, 0065-6, 0073, 0077, 0083, 0085, 0092, 0093, 0095, 0097, 0099, and 0102), Aston Sandford, Chearsley, Cheddington, Fawley, Fulmer, Hambleden, Hoggeston, and Hughendon, Buckinghamshire (0105, 0120, 0121, 0133, 0135, 0140, 0147, and 0149-50), Caldecot, Landbeach, and Toft, Cambridgeshire (0207, 0258, and 0277), Charlton Marshall and Poxwell, Dorset (0764 and 0846), Sible Hedingham, Essex (1122), Eastleach Martin, Gloucestershire (1208), Aldershot, Basingstoke, Bighton, Chalton, Clanfield, Colmer, Compton, Easton, Farley Chamberlayne, Mattingley, Newnham, Sherborne St John, Sherfield-on-Lodden, Stoke Charity, Upton Grey, Warblington, Whitchurch, Wield, Winchfield, Winchester (St Maurice), Winchester (St Michael), and Winchester (St Peter), Hampshire (1314, 1319, 1320, 1331, 1338, 1340, 1343, 1348, 1352, 1381, 1385, 1400, 1401, 1413, 1420, 1421, 1430-1, 1433, 1440, 1441, 1443, and 1445), Bushey and Kimpton, Hertfordshire (1608 and 1616), Chesterton, Huntingdonshire (1837), Twickenham, Middlesex (2313), Passenham, Northamptonshire (2371), Asthall, Aston Rowant, Bloxham, Brightwell Baldwin, Brize Norton, Broadwell, Dorchester, Ewelme, Harpsden, Marsh Baldon, Souldern, Waterstock, and Wendlebury, Oxfordshire (2535, 2537, 2540, 2543, 2546, 2548, 2555, 2558, 2567, 2577, 2604, 2612, and 2613), Bawdrip and Kingsdon, Somerset (2747 and 2876), Chertsey, Chiddingfold, East Clandon, and Ewhurst, Surrey (3471, 3472, 3474, and 3476), Cocking, Easebourne, and Findon, Sussex (3535, 3540, and 3552), and Aldbourne, Wiltshire (3751).

further correspondence analysis of this group does not clearly reveal further structure in the data. The first two dimensions of the correspondence analysis of cluster 10c is shown in Figure 121. Bells bearing the varieties of Roger Landen's shield (red) and those bearing the groat stamp (blue) are separated down the first axis. Although there is no clear boundary between the two groups, a chronological interpretation of this trend is consistent with the available, but limited, independent evidence of date.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-10 have been peeled away are shown in Figure 122 (see also Fig 87). This graph clearly shows the separation of bells from the London foundry (yellow) along the first axis, forming cluster 11. Correspondence analysis of this group[28] in turn clearly defines two sub-clusters (Fig 123). Cluster 11a[29] includes three bells bearing the grid iron which is interpreted as the trademark of Thomas Lawrence of London (1522-39). It also includes two bells, at Minchinhampton, Gloucestershire (1254) and Leaden Roothing, Essex (1062), cast with the dates 1515 and 1523 respectively (Table 2). The bell at Portslade, Sussex (3591) is recorded with the groat stamp which must have originated after 1351. The correspondence analysis of this group maps 77.4% of the total inertia in two dimensions. The bells form a Y-shape on this graph (not shown), which does not appear to indicate further structure in the data. Cluster 11b[30] includes bells bearing the names of three early fourteenth-century London founders. Bells recorded from Burham, Kent (1665) and Goring, Oxfordshire (2563=1129) bear the name of Richard de Wimbis, who was working *c* 1285 – 1315. The Goring bell can be dated further, as it bears an injunction to pray for Peter de Quivel, Bishop of Exeter (1280 – 91). A bell at Garboldisham, Norfolk (4475) bore the name of another London founder, William Schep (1319 – 47), until it was recast in 1884. Finally, a bell at Strethall, Essex (1129) bears the name of William Revel, who is documented in 1357 (see §2.1.1 for further details of all these craftsmen). Again the bells fall into a Y-shape in the first two dimensions of the correspondence analysis of this group (also not shown), probably indicating that there is no further meaningful structure in the data.

[28] Of the 407 bells in this group, five only contain one of the stamps in the group and so are removed before this analysis. These are the bells at Nether Compton, Dorset (0834), Wanlip, Leicestershire (1945), Greasley, Nottinghamshire (2471), Bathampton, Somerset (2744), and Worcester (St Swithun), Worcestershire (3980).

[29] Doddinghurst, Great Totham, Laindon Hills, and Leaden Roothing, Essex (1005, 1041, 1055, and 1062), Minchinhampton, Gloucestershire (1254), West Cliffe, Kent (1797), Walton, Suffolk (3434), and Portslade and Streat, Sussex (3591 and 3607).

[30] Peter's Marland, Devon (0674), Magdalen Laver and Strethall, Essex (1088 and 1129), Burham, Kent (1665), Westminster Abbey, Middlesex (2314), Garboldisham, Norfolk (4475), and Kingston-by-Lewes, Sussex (3573).

Returning to cluster E, the first two axes of the correspondence analysis of this group, once clusters 1-10, and 11a and 11b have been removed, is shown in Figure 124 (see also Fig 87). This clearly segregates two, undocumented, outliers forming cluster 11c,[31] from the main body of data. Correspondence analysis of this matrix forms a convincing parabola in the first and second dimensions (Fig 125), although again it can be demonstrated that this sequence is not strictly chronological.

Along the branch of the horseshoe towards the negative end of axis 1 and the positive end of axis 2 fall bells known to have been cast in London in the fifteenth century. This part of the map includes bells by Richard Hille (1416–40), his wife Johanna (1440–1), John Sturdy (1440–54), his wife Johanna (1460), John Kebyll (1480), and William Culverden (1497–1522). However, on the other branch of the horseshoe, towards the positive end of axis 1 and the positive end of axis 2, fall other bells also known to have been cast in London in the fifteenth century. This part of the map includes bells by William Chamberlyn (1440–74), John Danyell (1454–60), Richard Chamberlyn (1474–1510), and T Bullisden (1508–13). Both branches include bells by William Culverden's successor, Thomas Lawrence (casting 1522–39), and a bell attributed to Thomas Harrys (*c* 1478 – 9) falls in the centre of the parabola. At the base of the horseshoe are placed a group of bells by William Founder (1386–1421). It appears that parallel, contemporary, foundries descend in the fifteenth century from the business of William Founder, and that each occupies a branch of this map. This is a similar situation to that seen in the analysis of cluster 10, where separate branches descend from Roger Landen's foundry (Fig 120).

Partitioning this data according to the clearest gaps in the spread of points in the map shown in Figure 125 produces three clusters. The boundaries of these clusters are relatively obvious. Cluster 11d contains 95 bells, including 23 bearing the shield of William Founder (3.0014, shown in red in Fig 126).[32] There are no other documented

[31] Chebsey, Staffordshire (3044-5).

[32] The bells by William Founder are those at Abbotsham and Brushford, Devon (0480 and 0505-6), Aldham, Bradfield, Brightlingsea, East Ham, and Netteswell, Essex (0957, 0982, 0984, 1008, and 1102), Bramfield, Hertfordshire (1607), Downe and Upper Hardres, Kent (1694-5 and 1796), Abbot's Ripton, Huntingdonshire (1831), Newcastle upon Tyne, Northumberland (2431), Oxford (Magdalen College), Oxfordshire (2586-7), Kingsdon, Somerset (2875), Nedging, Oakley, South Elmham, and Ufford, Suffolk (3320, 3322, 3379, and 3431), and Folkington and Ninfield, Sussex (3557 and 3585). The other bells in this group are those at Hatford, Berkshire (0076), Newton, Cambridgeshire (0266), Creed, Gunwalloe, Llansallos, Little Petherick, and St Mawgan in Pyder, Cornwall (0296, 0303, 0308, 0309, and 0311), Brent Tor, Tor Mohun, and Woolborough, Devon (0501, 0705, and 0738), Melbury Sampford and Shapwick, Dorset (0824 and 0852-3), Belchamp Walter, Colchester (townhall), Copford, Frating, Great Braxted, Halstead, Leyton, Little Bardfield, Little Hallingbury, Little Horkesley, Little Warley, Mundon, Pebmarsh,

bells in this group, although bells by William (Fig 126, red) seem to be separated from those bearing the trefoil shield (Fig 126, blue) along the first axis, with only three bells bearing both shields (Fig 126, purple). Consequently it is likely that the trefoil shield is the trademark of a separate, related founder. The interpretation of the laver-pot shields (3.0086-7) is more complex. Although they occur on all but two of the bells in the matrix bearing the trefoil shield, and on six bells bearing William Founder's mark, there is also a substantial number of bells bearing only these shields (Fig 126, green). Some of these are separated by the second dimension of the correspondence analysis, although others appear to be by William Founder. In the absence of further documentary evidence, it is not possible to determine whether the uneven horseshoe formed by this analysis has chronological validity.

The correspondence analysis of cluster 11e is shown in Figure 127.[33] This again forms an uneven parabola, with bells by William Culverden (yellow) dominating the first axis, and those by Richard Hille (blue) the second. Bells by the Sturdys (light and dark brown), John Kebyll (grey), and Johanna Hille (sea green), however, form an undifferentiated clump towards the centroid. This map can be partitioned further, as shown in Figure 127, producing three more clusters (see also Fig 87).

Cluster 11g contains the bells by William Culverden,[34] and on further analysis forms a parabola in the first two dimensions of the correspondence analysis (not shown). Cluster 11h contains 41 bells, including all but two of the bells bearing the shield of Richard Hille, two bells bearing the shield of his wife Johanna, and one bearing that of John

Tolleshunt Major, and Willingale Spain, Essex (0976, 0996, 0998, 1019, 1027, 1045, 1068, 1071, 1082, 1083, 1087, 1099, 1106, 1142, and 1154). Herriard and Shipton Bellinger, Hampshire (1367 and 1403), Herford cathedral, Herefordshire (1508). Little Hormead and Stocking Pelham, Hertfordshire (1622 and 1637). Brenzett, Canterbury (St Paul), Canterbury (St Peter), Cuxton, Kemsing, St Pauls Cray, and Southfleet, Kent (1656, 1680, 1681, 1689, 1723, 1770, and 1780). Grafham, Great Paxton, and Great Staughton, Huntingdonshire (1841, 1843-4, and 1845). Grimolby, South Ormsby, Sutton-le-Marsh, Lincolnshire (2065, 2214, and 2234). Cringleford, Deopham, Ditchingham, South Lopham, and Surlingham, Norfolk (4426, 4432, 4440, 4686, and 4703). Oxford (Christchurch), Oxfordshire (2593-4), Barking, Butley, Clare, Great Cornard, Hawstead, Ipswich (St Mary Stoke), Ipswich (St Stephen), and South Elmham, Suffolk (3093-4, 3140, 3149, 3211, 3226, 3268, 3271, and 3378). Alfriston, Catsfield, Heyshott, Lewes and Woolbeding, Sussex (3502, 3523-4, 3563, 3575, and 3632). Brailes, Warwickshire (3653). Compton Bassett, Wiltshire (3783), and Scruton, Yorkshire (North Riding)(4327).

[33] Of the 144 bells in this group, two only bear one of the marks contained in this cluster and so are excluded from further analysis. These are the bells at East Chinnock, Somerset (2826) and Hove, Sussex (3565).

[34] Campton, Bedfordshire (0002-3), Steeple, Dorset (0858), Aveley, Elsenham, and Takeley, Essex (0968, 1012, and 1132), Furneaux Pelham, Hertfordshire (1611), Brentford, Middlesex (2294), and Kingstone, Staffordshire (3058-9).

Kebyll.[35] The first dimension of the correspondence analysis of cluster 11h separates bells by Richard Hille from the majority of the undocumented bells in the group (Fig 128), in a way that is not apparent from the correspondence analysis of cluster 11e (Fig 127).[36] Cluster 11i contains 91 bells.[37] including those attributed to John Sturdy, those of his wife

[35] The bells by Richard Hille are those at Staughton Parva, Bedfordshire (0034), Thornton, Buckinghamshire (0189), Castle Hedingham, Colchester (SS Nicholas & Runwald), and East Mersea, Essex (0987, 0994, and 1009), Shipton Moyne, Gloucestershire (1277), Cheriton and Luddesdown, Kent (1684 and 1735), Horton, Northamptonshire (2359), Great Glemham, Higham, Ringshall, Wangford, and Washbrook, Suffolk (3214, 3237, 3344, 3435, and 3436), East Horsley and Headley, Surrey (3475 and 3479), and Clayton, Sussex (3532). The bells at Colchester (SS Nicholas & Runwald), Essex (0995) and Ipswich (St Mary at Elms), Suffolk are by Johanna Hille (3267), and the bell at Croxton, Cambridgeshire (0235) bears the shield attributed to John Kebyll. Undocumented bells in this group are those at Castlethorpe, Buckinghamshire (0119), Bowers Gifford, Colchester (SS Nicholas & Runwald), Dedham, Layer Marney, Lindsell, Little Bromley, and North Benfleet, Essex (0980-1, 0995, 1003, 1060, 1066, 1075, and 1104), Gloucester cathedral, Gloucestershire (1213), Mapledurwell, Hampshire (1378), Kimpton, Hertfordshire (1617), Burmarsh, Canterbury (St Mary Magdalen), Cowden, and St Mary in the Marsh, Kent (1667, 1677, 1687, and 1769), Charlynch and Chiselborough, Somerset (2780 and 2786), Limpsfield and Mersham, Surrey (3482 and 3485), Fairlight, Sussex (3550), and Worcester cathedral, Worcestershire (3988). The bell at Albury, Herfordshire (1644) is in this cluster, but only contains one stamp in this group and so is excluded from further analysis.

[36] Following Stahlschmidt (1884, 81) these undocumented bells have been universally attributed to William Burford and his son Robert.

William Burford "citizen and bellzeter" is first recorded as a collector of the fifteenth in Portsoken ward in 1369 (Sharpe 1905, 252). He was granted a tenement by Alice Perrers in 1372 (Walters 1912, 370), and appears as a witness to deeds in 1373 and 1382 (Barron 1994, 99). He paid 2s towards a subsidy for the King in 1380 (McHardy 1977, 17). He was a common councilman for Portsoken ward in 1383–6 (Sharpe 1907; 240, 270, and 281). He wrote his will in 1390, and it was enrolled in the Hustings Court in 1393 (Stahlschmidt 1884, 38-41; Sharpe 1890, 301).

William's son, Robert, first appears as an executor of his will. He paid 8s 4d rent to Holy Trinity Priory for a tenement in Portsoken ward in 1392 (McHardy 1977, 76). On 28 May 1397 Henry Richard of Bodmyn appears in the patent rolls for not appearing "to answer Robert Burford, citizen and 'belleyetere' of London, touching a debt of £24" (Anon 1909c, 135). In 1405 Robert entered into a deed of conveyance to John atte Lee for some property in the parish of St Andrew Undershaft, abutting the house of the late Robert Rydere (see above cluster 11b; Stahlschmidt 1884, 32; Raven 1906b, 109). On 27 March 1405 he sued John Goldwyne for debt (Anon 1929, 501), and on 6 May 1407 he appeared in a dispute in the London Possessory Assizes relating to a messuage in the parish of St Olave by the Tower (Chew 1965, 96-8). In 1410 he was paid £31 14s 7d for a new bell and all its furniture, supplied by him to Shropham church, Norfolk (Blomefield 1805, 308). In 1411 he was assessed at £13 10s 7d for the 1412 lay subsidy (Boyd 1928, 4), and appears twice in the patent rolls suing Thomas Moriell and Robert Campeden for repayment of debts owed to him (Anon 1909b, 327 and 331). On 7 February 1412 he sued James de la Mare for another debt (Anon 1910c, 88). He wrote his will on 5 September 1418, and it was enrolled in the Commissary Court in October (Stahlschmidt 1884, 42-5, citing GL, MS 9171/3 v. 12). Further details of his affairs are provided by the inquisition into lands in Essex which he held at his death (Stahlschmidt 1889, 238-40).

Unfortunately none of the undocumented bells in Figure 128 can be dated. The placement of a single bell (Croxton, Cambridgeshire (0235) bearing the Kebyll shield in this group, might suggest that these bells are by a successor rather than a predecessor of Richard Hille. The reporting of this bell is problematic, however, as it is recorded with shield 3.0007 by Raven (1882, 138), but not by Raven (1869, v) or Deedes and Walters (1909, 13). Indeed H B Walters attributes this bell to William Burford. The correspondence analysis of group 11h perhaps confirms the existence of this separate group of bells but does not shed light on who cast them.

[37] The bells by John Sturdy are those at Adstock, Buckinghamshire (0104), Piddlehinton, Dorset (0843), Good Easter, Great Totham, and Little Totham, Essex (1023, 1040, and 1086), Gloucester cathedral, Gloucestershire (1216), Tallington, Lincolnshire (2242), Holton, Oxfordshire (2569), Norton, Suffolk (3321), Chichester and Heathfield, Sussex (3526 and 3562). Those by Johanna Sturdy are at Stoke Hamond, Buckinghamshire (0182), Langford, Layer de la Haye, Lindsell and Wormingford, Essex (1056, 1058,

Johanna, all but one of the bells bearing the Kebyll shield (3.0007), and the remaining bells by Johanna Hille. It also contains one bell attributed to Thomas Lawrence, at Margaretting, Essex (1090), and two dated bells. The treble at Wotton, Surrey (3497) bears the groat which was first struck in AD 1351 and so must be after that date. The sanctus bell at Fladbury, Worcester (3926) bears the name of Edward Gregson who was rector there in 1503–57 (Table 6). All the other bells in this group cannot be tied into the documentary record. The correspondence analysis of this group is shown in Figure 129. No further clustering is apparent from this map, with bells by John and Johanna Sturdy intermingled down the first axis. Bells by John Kebyll concentrate towards the positive ends of the first and second axes, although there is no clear separation between his bells and those of the Hille and Sturdy foundries.

Returning to the division of cluster 11 (see Figs 125 and 87), the correspondence analysis of cluster 11f[38] clearly segregates two outliers into cluster 11j[39] (not shown). The variation within the main group of bells is shown in the second and third dimensions of the analysis (Fig 130).[40] Bells by William Chamberlyn are concentrated towards the

1064, and 1158), Southwick and Winchester (St John the Baptist), Hampshire (1410 and 1437), Stoke D'Abernon, Surrey (3490), and Rotherfield, Sussex (3596), Ladbroke, Warwickshire (3675), and Watlington, Norfolk (4730). The Kebyll bells are at Edworth, Bedfordshire (0012), Chesham Bois and Little Linford, Buckinghamshire (0124 and 0157), Impington and Wood Ditton, Cambridgeshire (0250 and 0282), East Lulworth, Dorset (0780), Chickney, Colchester (St Leonard), Frating, Fyfield, Kelvedon Hatch, and Wickford, Essex (0988-9, 0993, 1020, 1021, 1052, and 1151), Brook, Penshurst, and Sandhurst, Kent (1661, 1759-60, and 1771), Mumby, Lincolnshire (2141), and Boxford, Hadleigh, Levington, Saxmundham, Stradbroke, and Sudbury (St Peter), Suffolk (3111, 3221, 3289, 3360, 3404, and 3415-7), and at Heytesbury, Wiltshire (3806). The remaining bells by Johanna Hille are at Manaton, Devon (0633-4), Norton, Hertfordshire (1629), and East Preston, Sussex (3545). A single bell by Thomas Lawrence is at Margaretting, Essex (1090). The undocumented bells in this group are at Harlington, Bedfordshire (0014), Beachampton, Chesham, and Shenley Mansel, Buckinghamshire (0112, 0122, and 0176), Winterbourne Abbas, Dorset (0900), Ardleigh, Lindsell, Little Totham, Maldon, Romford, Runwell, and Upminster, Essex (0962, 1066, 1085, 1089, 1117, 1118, and 1144), Bristol (St Webergh) and Gloucester cathedral, Gloucestershire (1183 and 1213-14 and 1218), Mapledurwell and Rotherwick, Hampshire (1378 and 1398), Chalk, Kent (1683), Abbotsleigh, Huntingdonshire (1830), South Ormsby and Wrawby, Lincolnshire (2213 and 2289), Curry Mallet, Somerset (2810-11), Bradfield Combust, Stoke by Nayland, and Sudbury (All Saints), Suffolk (3113, 3399, and 3412), Limpsfield, Walton-on-Thames, and Wotton, Surrey (3483, 3493, and 3497-8), Guestling, Sussex (3560), Bilton and Wolfhamcote, Warwickshire (3649 and 3709), Fladbury and Worcester cathedral, Worcestershire (3926 and 3990), and Featherstone, Yorkshire (West Riding)(4163).

[38] Of the 147 bells in this cluster only one, that at Tollard Royal, Wiltshire (3872) is removed before this analysis, having only one of the stamps in the group.

[39] The bells at East Hendred and Streatley, Berkshire (0067 and 0094).

[40] This group contains 37 bells attributed to William Chamberlyn. These are the bells at Wymington, Bedfordshire (0042), Broughton and Loughton, Buckinghamshire (0117-18 and 0161), Bartlow, Cambridgeshire (0201), St Allen, Cornwall (0319), Chetnole, Dorset (0769), Ashen, Thorington, Tillingham, and Woodham Walter, Essex (0967, 1136, 1139, and 1157), Ardeley, Hertfordshire (1597), Bearstead, Brookland, Harbledown, and Milstead, Kent (1651, 1662, 1712, and 1744), Steeple Gidding and Stow Longa, Huntingdonshire (1858 and 1861), Bratoft and Thorpe St Peter, Lincolnshire (2000 and 2251), Drayton-St-Leonard, Oxfordshire (2556), Gnosall, Staffordshire (3052), Boxford, East Bergholt, Ipswich (St Lawrence), and Wixoe, Suffolk (3109, 3176, 3263, and 3457), Clayton, Edburton, Iford, Litlington, and Tarring Neville, Sussex (3531, 3546, 3567 and 3569, 3578, and 3610), Brailes and Milverton, Warwickshire (3652 and 3686), Mere, Wiltshire (3827), and at Saxton, Yorkshire (West Riding)(4205-6). It

negative end of the second axis (Fig 130, light green), and those by his son Richard form an elongated group (Fig 130, pink), which is poorly separated from bells by T Bullisden (Fig 130, red) and bells by the owner of the 'IW' shield (3.0013; Fig 130, yellow). Bells bearing the initials 'ID', attributed to John Danyell (Fig 130, dark green), seem to be strongly associated with bells bearing medallion 7.0016 (Fig 130, blue), although two examples fall closer to bells by William Chamberlyn. The latest documented bell, the single example by Thomas Lawrence, occurs towards the edge of the map (Fig 130, purple). Again, it is apparent that there is no simple chronological progression around the rather untidy parabola shown on this map. The two branches of the horseshoe consist of bells by two groups of contemporary founders—John Danyell (*c* 1454–60) and related founders who used shields 7.0016 and 3.0013, and William Chamberlyn (1440–74) and his son Richard (1474–1510). It appears that both businesses descended ultimately to T Bullisden (1508–13), and thence to Thomas Lawrence (1522–39).

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-11 have been peeled away are shown in Figure 131 (see also Fig 87). Two further clusters are apparent from this map, separated along axis 2. The bells

also contains 12 bells bearing the shield of Richard Chamberlyn, his son: Cople, Bedfordshire (0009), Hardmead, Buckinghamshire (0142), St Clement, Cornwall (0322), Little Clacton, Essex (1078), Hartley Wespall, Hampshire (1358), Denton and Ryarsh, Kent (1691 and 1766), Smithfield (St Bartholomew the less), Middlesex (2312), Twywell, Northamptonshire (2396), Oldbury, Shropshire (2702), Swallowcliffe, Wiltshire (3868), and Birtsmorton, Worcestershire (3902). Twenty bells by T Bullisden are also included in this cluster: Northill, Bedfordshire (0028), Rampton, Cambridgeshire (0267), Landewednack and St Clement, Cornwall (0304 and 0321), Aldham, Dengie, Grays Thurrock, Mountnessing, and Weeley, Essex (0956, 1004, 1025, 1098, and 1147), Anstey and Hoddeston (townhall, Hertfordshire)(1595 and 1615), Cudham, Kent (1688), Nettleton, Lincolnshire (2145), Smithfield (St Bartholomew the Great), Middlesex (2305), Paulerspury, Northamptonshire (2373), East Dean and Edburton, Sussex (3542-3 and 3547), Wroxhall, Warwickshire (3714), and Aldbourne, Wiltshire (3750). Eight bells bearing the initials 'ID', attributed to John Danyell, are also in this group: Chellington, Bedfordshire (0007), Cambridge (King's College) and Cambridge (St Botolph), Cambridgeshire (0211 and 0214), Cranham and Great Maplestead, Essex (1000 and 1039), Winchester (Hyde), Hampshire (1436), Torksey, Lincolnshire (2253), and Bildeston, Suffolk (3107). The final documented bell in this group is that by Thomas Lawrence at Bedford, Bedfordshire (0001). The other bells in this group are at Eyeworth, Hockcliffe, Tingrith, and Wilden, Bedfordshire (0013, 0016, 0039, and 0040), South Hinksey, Berkshire (0090-1), Astwood, Edgcott, and Wingrave, Buckinghamshire (0107, 0128, and 0198), Cambridge (King's College), Cambridge (St Botolph), and Guilden Morden, Cambridgeshire (0213, 0216, and 0246), Pott Shringley, Cheshire (0291), St Kea, Cornwall (0332), and Exeter (St Petrock), Devon (0568), Fordington, Dorset (0790-1), Durham (St Margaret), Co Durham (0928), Abbess Roothing, Cranham, Great Easton, Great Holland, Great Waltham, Great Wigborough, Heybridge, Margaretting, Navestock, Sible Hedingham, Theydon Bois, and Wix, Essex (0954, 0999, 1033, 1036, 1042, 1044, 1048, 1093, 1100, 1121, 1135, and 1155), Rendcomb, Gloucestershire (1269), Hertford (the market bell), Eastwick, Harpenden, Little Hadham, Little Munden, and Thundridge, Hertfordshire (1592, 1610, 1613, 1620, 1623-4, and 1638), Adisham, Burmarsh, Denton, and Shipbourne, Kent (1646, 1668, 1801, and 1776), Downham, Lancashire (1816), Ellington, Huntingdonshire (1840), Cold Overton, Leicestershire (1886), Tealby, Lincolnshire (2253), Pilton, Tansor, and Twywell, Northamptonshire (2375, 2394, and 2397), South Muskham, Nottinghamshire (2510), Headington, Oxfordshire (2568), Angersleigh and West Monkton, Somerset (2730 and 3011), Lakenheath and Mildenhall, Suffolk (3281 and 3314-15), Balcombe, Brede, Jevington, Mountfield, Stopham, and West Chiltington, Sussex (3509, 3521, 3570, 3584, 3605, and 3620), Bilton and Hunningham, Warwickshire (3650 and 3671), Donhead, Wiltshire (3791), and Worcester cathedral, Worcestershire (3991).

in cluster 12 contribute 58.7% of the inertia defining this dimension, and the bells in cluster 13 contribute another 8.4%. Cluster 12 contains nine bells,[41] widely spread across the central midlands. None of these bells can be tied to the documentary record, and the first two axes of the correspondence analysis of this group do not suggest that any further division is appropriate. Cluster 13 contains six bells,[42] from Dorset and surrounding counties. These bells cannot be tied to the documentary evidence either, and the first two axes of the correspondence analysis form a parabola although its significance is unknown.

The first two axes of the correspondence analysis of the bells remaining once clusters 1-13 have been removed from cluster E are shown in Figure 132 (see also Fig 87). Three further clusters are apparent. Clusters 15 and 16 fall towards the positive end of the second axis and the negative end of the first axis respectively. Each of these clusters contains two bells only, and cannot be further subdivided.[43] Cluster 14, falling towards the negative ends of both first and second axes, contains 55 bells. Further correspondence analysis of this group[44] produces the map shown in Figure 133. Two more clusters are apparent, each containing three bells[45] none of which can be tied to the documentary record. These groups are too small for further analysis to be meaningful. The further division of cluster 14, once these two outlying groups have been removed, is shown in Figure 134. Cluster 14c contains five bells,[46] again undocumented, which form a parabola on further analysis. In the absence of links between the documentary record and the dataset, the significance of this map is unknown. Cluster 14d contains 39 bells,[47] and

[41] Weston on Avon, Gloucestershire (1305), Dalby Parva, Leicestershire (1896), Wadenhoe, Northamptonshire (2400), Bulcote, Nottinghamshire (2449), Preston, Rutland (2626), Fradswell, Staffordshire (3050), Beaudesert and Whitchurch, Warwickshire (3645 and 3707), and Broughton Hackett, Worcestershire (3906).

[42] Almer, Fontmell Magna, and Tolpuddle, Dorset (0745, 0789, and 0881), Charlton Canfield and Horsington, Somerset (2774 and 2863), and Winterbourne Gunner, Wiltshire (3889).

[43] Cluster 15 contains the bells at King's Ripton, Huntingdonshire (1856) and Thurning, Northamptonship (1862), and cluster 16 those at Gloucester (St Nicholas)(1219), and Worcester (St Andrew)(3976).

[44] Five bells contain only one of the stamps in cluster 14, and so are not included in this further analysis. These are the bells at Rame, Cornwall (0318), which bears the mark of Robert Norton of Exeter (3.0031), Bridford, Devon (0502), Shipton George, Dorset (0856), and Bradford and South Barrow, Somerset (2750 and 2959).

[45] Cluster 14a consists of the bells at Dewsall, Herefordshire (1483) and those at Ashley and Winterbourne Stoke, Wiltshire (3755 and 3890). Cluster 14b consists of the bells at Lillington and Winterbourne Anderson, Dorset (0811 and 0901-2).

[46] Buckham Weston, Langton Long Blandford, and Tarrant Crawford, Dorset (0756, 0809, and 0874), Templecombe, Somerset (2983), and Orcheston St Mary, Wiltshire (3840).

[47] Kingswear and West Teignmouth, Devon bearing the 'it' shield (3.0030)(0616 and 0725), Almer, Blandford, Broadwindsor, Chaldon Herring, Cheselbourne, Chettle, Cranborne, Fontmell Magna, Frome St Quentin, Godmanstone, Haselbury Bryan, Nether Cerne, Osmington, Swyre, Sydling, Tolpuddle, Winterbourne Came, and Winterbourne Whitchurch, Dorset (0743-4, 0751, 0753, 0761, 0767, 0771 and 0773, 0778, 0788, 0792, 0794, 0801, 0832, 0840, 0869, 0871, 0879, 0903, and 0908), Compton, Gatcombe, King's Somborne, Shipton Bellinger, and Winchester (St Michael), Hampshire (1342, 1355, 1372, 1404, and 1444), Charlton Musgrove, Closworth, and Nether Ham, Somerset (2777, 2795, and 2908), Allington,

again forms a parabola on further analysis (Fig 135). In this instance, the only two bells which can be linked to other bells in the dataset, on the basis of the iconography of shield 3.0030 which bears the initials 'it', are clear outliers, and the significance of the horseshoe form of the map is unclear.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-16 have been peeled away are shown in Figure 136 (see also Fig 87).[48] A fairly dispersed group is apparent along the negative end of the second axis, containing 15 undocumented bells.[49] Further analysis of this group (Fig 137) produces a two-dimensional map displaying 64% of the overall inertia. The bells may fall into an untidy parabola, or alternatively there may be an indication of a sub-group formed by the three bells towards the positive end of axis 1 and the negative end of axis 2. Again, in the absence of external information, the significance of this map is unclear.

Returning once more to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-17 have been peeled away are shown in Figure 138 (see also Fig 87). The bells on this map do form a reasonable parabola, although it is immediately apparent that the variation shown relates to the source of the bells rather than their date. Bells from the Exeter foundry (light brown) form the clearest group towards the positive end of axis 2 and the negative end of axis 1. These are separated from bells from the Bristol and Aish Priors foundries (light green and sea green) down the second axis through a lighter spread of undocumented bells, although the boundary between the two groups is by no means obvious. Along the first axis fall the remaining bells from foundries to the east and north—Salisbury (dark green), Leicester (dark brown), London (yellow), King's Lynn (black), and Lincoln (blue).

Fifty-eight bells are included in cluster 18, and on further correspondence analysis this group[50] forms a parabola in the first two dimensions (Fig 139). Examination of the

Baverstock, Great Cheverell, North Newnton, Pewsey, South Newton, Stanton St Bernard, Winterbourne Earls, and Winterbourne Stoke, Wiltshire (3753, 3759, 3800, 3832, 3844, 3862, 3864, 3888, and 3891).

[48] A further bell, that at Sherborne, Dorset (0855), is excluded at this stage of the analysis as it bears only one of the stamps remaining in cluster E.

[49] Cluster 17 constist of bells at Gretton, Leonard Stanley, Notgrove, Sapperton, Syde, Turkdean, and Winstone, Gloucestershire (1222, 1249, 1256, 1272, 1293, 1296, and 1306), Acton Scott and Clungunford, Shropshire (2636 and 2662), Clapton in Gordano and Trent, Somerset (2794 and 2996), Atherstone-on-Stour, Warwickshire (3638), and Broadwas, Great Malvern, and Little Malvern, Worcestershire (3904, 3928, and 3944).

[50] Seven of these bells only bear one of the marks in this group and so are not included in this analysis. The bell at Newton Tracey, Devon (0662) bears the 'rn' shield (3.0031) and that at Woodleigh, Devon (0737) bears the 'it' shield (3.0030). The other five bells are those at Ashcombe, Devon (0488), Caundle Stourton

external evidence suggests that bells bearing the 'rn' shield (3.0031) lie towards the centre of this arc,[51] with bells by 'it' (bearing shield 3.0030) towards the positive end of the first axis.[52] The bell at St Nicholas, Gloucester (1193=1220), lying towards the negative end of this axis, must date to before 1514 as it was cast during the time when Clement Lichfield was sacrist of Gloucester Cathedral, and he became Abbot of Evesham Abbey in that year (see §2.1.10). This bell also bears the name of Robert Hendley, an otherwise undocumented founder. It may be, therefore, that 'it' was a predecessor of Robert Norton, and that Hendley succeeded to the latter's business. In this case, the parabola shown in Figure 139 may be of chronological significance. An alternative interpretation is, however, possible. In this case, Robert Norton's business was succeeded by two workmen, 'it' in Exeter and Robert Hendley working in the Gloucester region, and the two arms of the arc are separate, contemporary, businesses. This is similar to the situation already observed for the successors of Roger Landen in Wokingham (Fig 120) and the successors of William Founder in London (Fig 125). Tentative support for the second interpretation of this analysis may be provided by the location map of these bells (Fig 140), which demonstrates that the bells falling towards the negative end of the first axis (cluster 18c[53]) have a noticeably different distribution from those by 'rn' and 'it'. If cluster 18 is further partitioned, as shown in Figure 139, then further correspondence analysis of the resultant clusters does not reveal any further structure in the data.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-18 have been peeled away are shown in Figure 141 (see also Fig 87).[54] The bells in this map form a convincing parabola, with West Country foundries (Bristol, light green and Aish Priors, sea green) to the negative end of the first axis, and bells from foundries further east towards the positive end (Salisbury, dark green; London,

and Iwerne Minster, Dorset (0760 and 0806), and Brean and Clapton in Gordano, Somerset (2756 and 2793).

[51] Cluster 18b consists fourteen bells at St Erney, Cornwall (0327), Caverleigh, Churston Ferrers, Dunterton, East Portlemouth, Exeter (St Pancras), Frithelstock, Knowstone, Luffincott, and Mortehoe, Devon (0518, 0522, 0553, 0558, 0567, 0574, 0618, 0626, and 0656), Broadwindsor, Dorset (0755), and Angersleigh, Bicknoller, and Halse, Somerset (2729, 2748, and 2847).

[52] Cluster 18a consists of ten bells at Perranarworthal and St Michael Carhayes, Cornwall (0317 and 0335), Churston Ferrers, Clyst St George, Fen Ottery, Hennock, Northleigh, and Trusham, Devon (0521, 0530, 0570, 0584, 0663, and 0709), and Brompton Ralph and Over Stowey, Somerset (2760 and 2924).

[53] There are 27 bells in this cluster—those at Ashbury, Ashford, Horwood, and West Ogwell, Devon (0486, 0489, 0599, and 0722), Aldsworth, Brimpsfield, Charfield, Charlton Abbots, Compton Abdale, Cormhall, Horton, Lower Slaughter, and Standish, Gloucestershire (1166-8, 1177, 1193, 1194, 1198, 1200, 1238, 1251, and 1283), Foxcott, Hampshire (1354), Aston Ingham and Kilpeck, Herefordshire (1455 and 1518), Dorchester, Oxfordshire (2554), Highley, Shropshire (2678), Chilthorne Domer and Priston, Somerset (2785 and 2938), Butler's Marston and Offchurch, Warwickshire (3655 and 3692), Crudwell and South Marston, Wiltshire (3786 and 3859), and Overbury, Worcestershire (3957).

yellow; King's Lynn, black; Lincoln, blue). Trailing from the base of the horseshoe are the remaining bells from the Midland foundries (Leicester, dark brown; Wokingham, pink). There is clear separation of the bells from the West Country foundries down the first axis, and so these may be peeled away to form cluster 19 of 137 bells.

Correspondence analysis of cluster 19 clearly separates three bells into a sub-group, cluster 19a.[55] This is too small for further variation to be discerned, although two of the bells bear the initials 'RS'. For this reason, the group can be attributed to Roger Sempson of Aish Priors, Devon who is attested in 1558-9 (see §2.3.7).

Further correspondence analysis of cluster 19, once cluster 19a has been removed, is shown in Figure 142. The bells form a rather ragged horseshoe, with some gaps suggesting the presence of further clusters. Separated towards the positive end of the second axis is a group of 21 bells, forming cluster 19b.[56] Two bells in this group can be tied to the documentary record, the treble at Oldbury on the Hill, Gloucestershire (1258) bears 7.0074, a variant of the Bristol ship, and the ninth at Hereford cathedral bears the name of William Warwick (1506=1279). Analysis of this group produces a rather untidy parabola of bells (not shown), but little indication of further sub-divisions in this group. Separated from the base of the horseshoe apparent in Figure 142 falls another small group of bells, cluster 19c.[57] None of these bells can be tied to the documentary record, and further analysis does not reveal further variation in the group.

The remaining bells in cluster 19 are spread along the first axis of the map shown in Figure 142, with no clear separation between groups of bells. There are some areas of the map where fewer bells occur, however, and it is through one of these that the division between clusters 19d and 19e has been drawn. Although it is unlikely that the partition would have been drawn precisely at this point without the external evidence, if the analysis is repeated using only the bells and stamps in clusters 19d and 19e, this division appears more strongly on the resultant map (not shown). This provides some support for

[54] Two bells bear only one of the stamps remaining in this group and so have been excluded from this analysis. These are those at Westerleigh, Gloucestershire (1303) and Castle Frome, Herefordshire (1479).
[55] Challacombe and Luppit, Devon (0520 and 0630) and Combe St Nicholas, Somerset (2798).
[56] Buscot, Berkshire (0057), Alwington, Devon (0483), Alderley, Bristol (St Stephen), Hardwicke, Oldbury on the Hill, Pitchcombe, Siddington, Snowhill, and Upper Slaughter, Gloucestershire (1165, 1179, 1225, 1258, 1265, 1279, 1281, and 1298), St Devereux, Herefordshire (1558), Kingsbury Episcopi, Locking, Loxton, Otterhampton, and South Barrow, Somerset (2874, 2893, 2900, 2923, and 2958), Wisset, Suffolk (3454), and Atworth, Hillmorton, Long Newnton, and Sutton Benger, Wiltshire (3756, 3808, 3821, 3866).
[57] Winterbourne Steepleton, Dorset (0907), Weston Bampfylde, Somerset (3015), and Leigh, Lyneham, and Patney, Wiltshire (3814, 3823, and 3842).

the robustness of this partition. Cluster 19d contains 30 bells,[58] of which 19 bear variants of the Bristol ship (7.0074-7; see Appendix 3). Further analysis of this group does not suggest that further sub-division is appropriate. Cluster 19e contains 78 bells, of which 15 bear the initial "tg", four the initials "hi", and six the initials "rt".[59] These bells can be attributed to Thomas Gefferies of Bristol (1518-45), his son Harry (1545-*c*60), and an unknown founder with the initials "rt" respectively (see §2.3.1). A single bell bearing shield 3.0031, attributed to Robert Norton of Exeter (1423-32) also occurs in this group. Correspondence analysis of cluster 19e produces the maps shown in Figures 143 and 144. The second dimension is influenced heavily by three outlying bells, which between them contribute 46.1% of the inertia of this axis. For this reason, examination of the map of the first and third dimensions (Fig 144) is more informative. The bells form a single group, with bells by different founders poorly separated. There may be a hint of chronological sequence along the first axis, with bells by Harry Gefferies (1545-*c*60), his father Thomas (1518-45), "rt", and Robert Norton (1423-32) progressing from negative to positive values in this dimension. It is unlikely, however, that in the absence of external information such a chronological interpretation could be gleaned from this map.

Once clusters 1-19 have been peeled away, further analysis of the remains of cluster E produces the map shown in Figure 145 (see also Fig 87). Two further clusters are clearly

[58] Sheepwash and Yarnscombe, Devon (0685 and 0742), Langton Matravers, Dorset (0810), Abson, Alveston, Horton, Saul, Staverton, Stoke Giffard, Tortworth, and Wapley, Gloucestershire (1164, 1170, 1236, 1274, 1286, 1287, 1295, and 1300-1), Backwell, Badgworth, Brockley, Burrington, Cameley, Charlton Queen, Crowcombe, Great Elm, Lamyatt, Limington, Litton, Northover, Queen Camel, Sutton Montis, and Weston Bampfylde, Somerset (2735, 2737, 2758, 2765, 2769-70, 2778, 2806, 2842-3, 2882, 2889, 2892, 2912, 2943, 2980, and 3014), and Cherhill, Wiltshire (3775).

[59] The bells at Hartpury, Gloucestershire (1229) and Calne, Wiltshire (3770) bear only one of the stamps in this group and so are not included in further analysis. The bells bearing the initials "tg" are those at Alwington, Brendon, and Huntshaw, Devon (0485, 0497, and 0605), Wambrook, Dorset (0887), Brimpsfield and Stoke Giffard, Gloucestershire (1176 and 1288), Dinder, Greinton, Hawkridge, Laverton, Nynehead, Puriton, and Shapwick, Somerset (2814, 2845, 2849, 2887, 2910, 2941, and 2955), and Fyfield and Hankerton, Wiltshire (3798 and 3803). Those bearing the initials "hi" are at Backwell and Clapton in Gordano, Somerset (2734 and 2792) and West Overton and Winsley, Wiltshire (3881 and 3886), and those bearing the initials "rt" are at Horwood, Devon (0600), Bristol (St Thomas), Gloucestershire (1181), Butcombe and Ubley, Somerset (2767 and 3000), and Great Somerford and Box, Wiltshire (3716 and 3765). The bell bearing the Robert Norton shield (3.0031) is at White Stanton, Somerset (3022), and a bell at Hereford cathedral (1506) bears the name of William Warwick. The other bells in this group are those at Towednack, Cornwall (0341), Challacombe, Lynton, Mollard Bottreaux, and Warkleigh, Devon (0519, 0631, 0645, and 0714), Ampney Crucis, Bristol (St Thomas), Bristol (St Werbergh), Bristol cathedral, Brookthorpe, Duntisbourne Rous, Elberton, Horton, Leighterton, Oldbury on the Hill, Siddington, Swindon, Westerleigh, Woodchester, and Yate, Gloucestershire (1172, 1180, 1182, 1185-6, 1189, 1205, 1210, 1237, 1248, 1257, 1280, 1291, 1304, 1309, and 1312-13), Hereford cathedral (1507), Brean, Buckland Dinham, Compton Dando, Ditcheat, Holcombe, Kingston, Langridge, Long Ashton, Nunney, Stoke Pero, Stoke Rodney, and Yatton, Somerset (2757, 2764, 2799, 2816, 2855, 2878, 2884, 2894, 2916, 2966, 2967-8, and 3031), and Grittleton, Holt, Kemble, Little Hinton, Littleton Drew, Luckington, Ogbourne St Andrew, Poulshot, Somerford Keynes, Tockenham, and Winsley, Wiltshire (3801-2, 3809, 3811, 3817, 3818, 3822, 3837, 3847, 3856-7, 3870, and 3887).

separated from the main body of data. Cluster 20 contains eight bells,[60] including a single example bearing the trademark of Roger Landen of Wokingham (3.0018) at Hordley, Shropshire (2683). If this incidence is not an error in data recording,[61] then it appears that this stamp may have come into the hands of the founder of this group of bells after Landen's death, as the distribution of surviving examples (Fig 146) makes it extremely unlikely that they were cast by a founder based in Wokingham. Further analysis of cluster 20 reveals no further structure within this group. Cluster 21 contains 13 bells, including two bearing the shield of Thomas Bett of Leicester (1521-380)(3.0078),[62] which clearly form a separate cluster on further analysis (cluster 21a;[63] not shown). The other group formed by this analysis, cluster 21b,[64] does not contain any documented bells or stamps and also shows no further sub-grouping.

The first two dimensions of the correspondence analysis of cluster E, once groups 1-21 have been removed, are shown in Figure 147 (see also Fig 87). Six bells, five of which bear the initials "TH", are clearly segregated to form cluster 22.[65] These bells have been tentatively attributed to Thomas Harrys of London (1478 – 9), and a single example has appeared previously in this analysis associated with cluster 11e.[66] Cluster 22, however, seems to represent the main body of work by this founder, as further analysis reveals no further sub-grouping.

Clusters 23 and 24 can be separated from the parabola of bells mapped by the correspondence analysis of the cluster E, once groups 1-22 have been removed (Figs 87 and 148). Cluster 23 contains 15 bells,[67] including three which can be tied to the

[60] Adderley, Hope Bowdler, Hordley, and Wrockwardine, Shropshire (2639, 2680, 2683, and 2726), Baswich, Brewood, and Weston-under-Lyziard, Staffordshire (3036, 3041, and 3075), and Curdworth, Warwickshire (3662).

[61] This is by no means impossible as 3.0018 is recorded here by Owen (1899, 10), but not by Walters (1915, 245, 401-2). Although Walters (ibid) does attribute the bell to Landen, Clouston (pers comm 4 1986) attributes it to an unknown Staffordshire founder casting *c* 1400 and so he may not have seen this shield on the bell.

[62] These are the bells at Appleby, Lincolnshire (1959) and Tresswell, Nottinghamshire (2523).

[63] This analysis does not include the bell at Norton Bavent, Wiltshire (3833) which only contains one of the stamps in cluster 21.

[64] Cluster 21b consists of the bells at Ashford, Devon (0490), Maiden Newton, Dorset (0819), Woolhope, Herefordshire (1588), and Babcary, Durleigh, Fivehead, Ile Abbots, Inglishcombe, Milton Clevedon, and Weare, Somerset (2733, 2822, 2849, 2865, 2870, 2903, and 3004).

[65] Nettledon, Buckinghamshire (0166), Henham, Essex (1047), Hampton Court, Middlesex (2301), Blatherwycke and Potterspury, Northamptonshire (2322 and 2376), and Limpsfield, Surrey (3481).

[66] The bell at Hove, Sussex (3565), although partitioned into cluster 11e, bears only one of the types included in that group.

[67] Little Brady and Yetminster, Dorset (0812 and 0912), Leonard Stanley and Sapperton, Gloucestershire (1250 and 1273), Acton Beauchamp, Hereford (St Peter), and Leysters, Herefordshire (1450, 1512, and 1527), Swyncombe, Oxfordshire (2609), Astley Abbots, Shropshire (2643), Acton Trussell and Standon,

documentary evidence. A bell at Chitterne, Wiltshire (3779) bears the name "IHON BARBUR", another at Swyncombe, Oxfordshire (2609) bears the initial "R", and the second at Acton Trussell, Staffordshire (3033) bears shield 3.0078. John Barber was working in Salisbury in 1396-1404 (see §2.1.7). "R" is an unknown southern founder (see §2.3.8), and 3.0078 was probably the trademark of Thomas Bett of Leicester (1521-39; see §2.2.4.1). The map of the first two dimensions of the correspondence analysis of cluster 23 is shown in Figure 149. The bells form a neat parabola, with only that known to be by John Barber falling within the horseshoe. "R" occurs to one extreme of the arc, and that by Bett towards its apex. No further clustering is visible from this map.

The boundary of cluster 24 on the map shown in Figure 148 is less clear than that for cluster 23. The division has been drawn through the clearest gap in the spread of bells, although, if the external information were to be taken into account, this partition would occur closer to the centroid. Twenty-five bells form this cluster, which divides clearly into two smaller groups on further analysis (Fig 150).[68] Cluster 24a contains eight bells,[69] all bearing shield 3.0044—the trademark of Robert Clerke of Lincoln (1483 – 1502; see §2.2.4.5). These bells form an untidy parabola on further analysis, exhibiting no sign of further sub-division. Cluster 24b contains 15 bells,[70] none of which can be tied to the documentary evidence. All but the bell at Stowe, Staffordshire (3071), however, bear shield 3.0085. This may be a trademark, suggesting that they were cast by a single founder, although five of the bells in cluster 24a bear this mark in addition to Clerke's trademark. Further analysis of cluster 24b forms a rough parabola and does not suggest the presence of further grouping within this cluster.

Returning to cluster E, the first two axes of the correspondence analysis of the bells remaining once clusters 1-24 have been peeled away are shown in Figure 151 (see also Fig 87). Two more groups are clearly apparent. Cluster 25 contains five bells[71] and cluster

Staffordshire (3033 and 3069), Lapworth, Warwickshire (3676), Chitterne and Odstock, Wiltshire (3779 and 3836), and Stanford-on-Teme, Worcestershire (3968).

[68] Two bells, those at Seagrave, Leicestershire (1930) and Ryton-on-Dunsmore, Warwickshire (3695), contain only one of the stamps in cluster 24 and so are not included in this analysis.

[69] Bunbury, Cheshire (0283), Scarcliffe, Derbyshire (0457), Huyton, Lancashire (1822), Asgarby, Aylesby, and Deeping St James, Lincolnshire (1962, 1970, and 2030), Syerston, Nottinghamshire (2519), and Mayfield, Staffordshire (3063).

[70] Derby (All Saints), Derbyshire (0428), Croxton Kerrial and Saltby, Leicestershire (1894 and 1928), Lavington, Lincolnshire (2117), Askham, Cromwall, Granby, and Stanford-on-Soar, Nottinghamshire (2442, 2458, 2470, and 2511), Abbot's Bromley, Caverswall, Chapel Chorlton, Stowe, Waterfall, and Yoxall, Staffordshire (2789, 3042, 3043, 3071, 3073, and 3081), and Ledsham, Yorkshire (West Riding)(4183).

[71] Little Missendon, Buckinghamshire (0158), Cherry Hinton and Kingston, Cambridgeshire (0225 and 0257), Adwell, Oxfordshire (2532), and Barnardison, Suffolk (3096).

26 contains nine.[72] None of these bells can be tied in to the documentary evidence, and on further analysis[73] no further sub-divisions are apparent.

The first two axes of the correspondence analysis of cluster E, once clusters 1-26 have been removed, are shown in Figure 152 (see also Fig 87). Two small clusters are revealed, cluster 27 containing three bells[74] and cluster 28 containing two.[75] Both clusters are too small for further analysis, and neither contain bells which can be tied to the documentary evidence. Further analysis of cluster E, once these clusters have also been removed, produces the map shown in Figure 153 (see also Fig 87). There are clear gaps in this map, dividing the bells into three groups. Cluster 29 is separated from clusters 30 and 31 in the second dimension, with bells in this group contributing 65.6% of the total inertia. Clusters 30 and 31 are separated along the first axis, and between them account for 93.4% of the total inertia of this dimension.

Cluster 29 contains ten bells,[76] including three inscribed with the name "DERBY" and one bearing the name "WILLELMUS ROFFORDE" (1641=1614). The "DERBY" bells were cast by Thomas Derby of King's Lynn (1450; see §2.1.3), and William Rofforde, of Toddington, Bedfordshire, appears in documents in 1390 and 1398 (see §2.1.7). There is, however, no separation between the bells of these men in the map of the first two dimensions of the correspondence analysis of cluster 29 (Fig 154). There is perhaps some indication of a parabola in this map, although it does not seem to have interpretative significance.

Cluster 30 consists of 19 bells, which fall neatly into two groups on further analysis (Fig 155). One consists of five bells bearing shield 3.0044[77]—the trademark of Robert Clerke of Lincoln (1483 – 1502: see §2.2.4.5). These are the five bells by this founder falling closest to cluster 24 in the map shown in Figure 148, and it seems that clusters 24a and

[72] Beachampton, Buckinghamshire (0113), Sherborne, Gloucestershire (1276), Radston, Northamptonshire (2379), Alkerton, Oxfordshire (2533), High Offley, Staffordshire (3055), Barnham, Fittleworth, and North Mundham, Sussex (3510, 3555, and 3586), and Bearley, Warwickshire (3644).
[73] The bells at High Offley, Staffordshire (3055) and Bearley, Warwickshire (3644) each bear only one of the stamps in cluster 26 and so are excluded from this analysis.
[74] Brindle, Lancashire (1807) and a pair at Barnetby le wold, Lincolnshire (1971-2).
[75] Keele, Staffordshire (3057) and Monk's Kirby, Warwickshire (3687).
[76] Hardmead, Buckinghamshire (0144), Caldecot and Chippenham, Cambridgeshire (0208 and 0229-30), Ardeley and Hexton, Hertfordshire (1596 and 1614), Ampton, Suffolk (3084), and Besthorpe, Burnham Deepdale, and Wimbotsham, Norfolk (4384, 4412, and 4752).
[77] Cluster 30a contains the bells from Claxby, Frodingham, Tealby, and West Rasen, Lincolnshire (2020, 2050, 2244, and 2281), and Wickersley, Yorkshire (West Riding)(4238).

30a are related. Further analysis of cluster 30a[78] shows no further meaningful variation within the group. Cluster 30b consists of fourteen bells.[79] Three of these can be firmly associated with documentary evidence. A bell at Radclive, Buckinghamshire (0174) was cast with medallion 3.0014, which bears the name of William Founder (London, *c* 1386 – 1421), and two bells bear shield 3.0085. One of these, at Stoneleigh, Warwickshire (3700), must date to between 1488 and 1531 because it bears the initials of Richard Kydermynseter who was Abbot of Winchcombe between these dates (Table 5). The significance of the parabola formed in the map of the correspondence analysis of cluster 30b (Fig 156) is unclear, although, on the basis of the limited documentary evidence, the branches of this arc may relate to different founders rather than chronology.

The final group formed by the correspondence analysis of cluster E, cluster 31, contains 25 bells (Figs 87 and 153). Further analysis of this group shows that it can be clearly divided into two sub-groups (Fig 157). Cluster 31a contains 17 bells.[80] One of these, the tenor at Bitterley, Shropshire (2655=2638), must have been cast before 1415 when Alice Stury, the donor, died (see §2.4.1). These bells form a parabola on further analysis, the significance of which is unknown. Cluster 31b contains eight bells,[81] one of which bears the initials "TH" and so may be attributed to Thomas Harrys (1478-9). The further analysis of this group does not reveal further clear structure within this data, although the isolation of the bell by Harrys may suggest that the other bells in this group may be by a different founder (Fig 158).

4.3 Results (clusters of stamps)

[78] Excluding the bell from Wickersley, Yorkshire (West Riding)(4238) as this contains only one of the stamps in this group.

[79] Radclive, Buckinghamshire (0174), Cambridge (King's College), Cambridgeshire (0212), Christchurch, Hampshire (1336-7), Wyddial, Hertfordshire (1645), Bury, Huntingdonshire (1835), Edlington, Haltham-on-Bain, Lincoln (St Peter-at-Gowts), Wainfleet All Saints, and Wellingore, Lincolnshire (2039, 2077, 2124, 2263, and 2271), Stowe-nine-churches, Northamptonshire (2451), Burton Joyce, Nottinghamshire (2451), and Stoneleigh, Warwickshire (3700).

[80] Sundon, Bedfordshire (0036), Great Shelford, Cambridgeshire (0244), Boddington, Coberley, Dyrham, Huntley, Kempley, and Winstone, Gloucestershire (1173, 1196, 1207, 1239, 1243-4, and 1307), Ashperton and Holmer, Herefordshire (1452 and 1513), Thurcaston and Kegworth, Leicestershire (1941 and 2293), Grafton Regis, Northamptonshire (2348), Teigh, Rutland (2629), Acton Scott, Shropshire (2638), and Nettleton, Wiltshire (3830).

[81] Brinsop, Leysters, Pembridge, and Thornbury, Herefordshire (1465, 1528, 1547, and 1568), Lillington, Warwickshire (3679), and Shelsley Walsh, Spetchley, and Stanford-on-Teme, Worcestershire (3961, 3966, and 3969).

The correspondence analysis the complete reduced incidence matrix of 1289 bells and 509 stamps was also examined for the formation of groups and series of stamps. A summary of the clusters formed by 'peeling' away groups of stamps and successive correspondence analysis of the remaining data is provided in Figure 159.

The clusters produced by this analysis are very similar to those formed by the partition of the maps of bells. The initial analysis identifies clusters A-E, which are identical to those produced by the previous partition (Fig 86).[82] The next three steps in the division of cluster E also produce clusters containing the same stamps as those in the previous partition—clusters 1 and 2 are equivalent to those in the previous analysis (Fig 89), and cluster 3 is equivalent to cluster 4 (Figs 92 and 95).[83]

A slightly different partition is produced by the next step in the analysis of cluster E (Fig 160). Cluster 4[84] contains three sub-groups (Fig 161), equivalent respectively to cluster 6b (Figs 96, 99, and 101), cluster 5a (Fig 97), and cluster 5b (Figs 97 and 98). The subjective nature of the visual approach to the partition of the maps is exemplified by the bells and stamps in cluster 4a/6b, as this group is placed with founders from Norwich when the map of bells is inspected (Fig 96), and with founders from Bury St Edmunds when the map of stamps is inspected (Fig 160). In fact, the founder of the bells and user of the stamps in this group probably had connections with both foundries, so this drawback of the approach may be venial (or even informative!). The map of stamps in cluster 4c (Fig 162) does form an untidy parabola, which may suggest a chronological trend in the use of stamps, although this cannot be proven in the absence of more documented stamps. This trend is not apparent in the equivalent map of bells (Fig 98). Cluster 5[85] contains two sub-groups (Fig 163), cluster 5a being equivalent to cluster 6c of the partition of bells and cluster 5b equivalent to cluster 6d. No further division is apparent from the further analysis of either group, the apparent lack of structure in the larger group, cluster 5b, being particularly notable (not shown, but see Figs 104-5). Clusters 6 and 7 also show no further sub-grouping. Cluster 6 contains the same stamps as cluster 3 in the partition

[82] Cluster A contains stamps 1.0049, 2.0030, 6.0031, and 8.0188; cluster B contains stamps 1.0172, 2.0158, and 8.0170; cluster C contains stamps 6.0006, 7.0031, and 7.0086; and cluster D contains 2.0155, 3.0096, and 2.0155. Cluster E contains all the remaining stamps.
[83] Cluster 1 contains stamps 1.0129, 2.0038, 2.0144, 3.0075, 8.0094, and 8.0183; cluster 2 contains stamps 1.0064, 5.0007, 6.0012, 7.005-7, 7.0027-8, 7.0049, and 8.0077; and cluster 3 contains marks 1.0094, 1.0171, 1.0208, 1.0249, 1.0266, 1.0268, 2.0045, 2.0116, 2.0130, 2.0166, 5.0050, 5.0063, 6.0021, 8.0016, and 8.0230.
[84] Cluster 4 contains 24 marks: 1.0018, 1.0052, 1.0173, 1.0187, 1.0206, 1.0255, 1.0306-7, 2.0036, 2.0043, 2.0079, 2.0114, 2.0157, 2.0173, 3.0061-2, 3.0089-90, 5.0095-6, 8.0083, 8.0163, 8.0222, and 8.0246.

according to bells (with the addition of the uncrowned royal arms, 3.0005), and cluster 7 is identical to cluster 7a in that partition.[86] Further analysis of this group forms an untidy horseshoe, the significance of which is unknown in the absence of stamps which can be tied to the documentary record.

The correspondence analysis of cluster E, once clusters 1-7 have been removed, clearly segregates two further groups (Fig 164). Cluster 8 itself divides into three groups on further analysis (Fig 165). Cluster 8a is equivalent to cluster 7b from the partition of bells, eight of the ten stamps in cluster 8b appear in cluster 7e, and cluster 8c is equivalent to cluster 7c of the previous partition. None of these groups show sub-divisions on further analysis, although the stamps in cluster 8c form a parabola. The significance of this is unknown. Cluster 9 is identical to cluster 8 from the partition of bells and shows no further division.[87]

Clusters 10 and 11 are isolated by the next division of the remnant of cluster E (Fig 166).[88] Cluster 10 does not further divide, and is equivalent to cluster 6a of the partition of bells. Three sub-groups are apparent on the further analysis of cluster 11 (Fig 167). Cluster 11a only contains three stamps, two of which occur in cluster 21a of the partition of bells and the other in cluster 11c. Nine of the eleven stamps in cluster 11b occur in cluster 9d of the previous partition, including the trademarks of Ralph I Heathcote of Chesterfield (3.0025), Ralph II Heathcote (3.0065), Ralph II and George Heathcote working in partnership (3.0028), George Heathcote (3.0036), and Thomas Bett of Leicester (3.0078) . Cluster 11c is identical to cluster 9c of the partition of bells. The stamps in this final group form a horseshoe in the map of the first two axes of the correspondence analysis of cluster 11c, although the significance of this is unknown as all the stamps are undocumented.

[85] Cluster 5 contains 27 stamps: 1.0071, 1.0079, 1.0160, 1.0165, 1.0194, 1.0212, 1.0288-9, 2.0176, 3.0091-4, 4.0017, 5.0023, 5.0080-1, 7.0012-13, 7.0019, 7.0094-5, 8.0154, 8.0237, 8.0243, 8.0245, and 8.0247.
[86] Cluster 6 contains stamps 1.0127, 1.0136, 1.0251, 2.0046, 2.0086, 2.0102, 2.0160, 3.0071-2, 5.0055-6, 7.0017-18, 7.0029, and 7.0057; and cluster 7 contains stamps 1.0148, 1.0156, 2.0029, 6.0004, 7.0082, 8.0071, and 8.0079.
[87] Cluster 8 contains 29 stamps: 1.0059, 1.0112, 1.0128, 1.0168, 1.0244, 1.0246, 2.0015, 2.0020, 2.0034, 2.0037, 2.0126, 2.0142, 3.0034, 3.0048-9, 3.0095, 5.0020, 7.0037, 7.0042, 7.0060-1, 8.0065, 8.0076, 8.0080, 8.0109, 8.0171, 8.0177, 8.0208, and 8.0219; and cluster 9 contains 6: 1.0241, 1.0245, 1.0269, 2.0039, 7.0022, and 8.0238.
[88] Cluster 10 contains stamps 1.0188, 1.0230, 2.0081, and 8.0075; cluster 11 contains stamps 1.0051, 1.0055, 1.0234, 1.0278, 2.0033, 3.0025, 3.0028, 3.0036, 3.0043, 3.0040, 3.0065, 3.0078, 5.0008, 5.0013, 5.0018, 5.0041, 6.0011, 8.0006, 8.0022, 8.0186-7, and 8.0253.

Once clusters 1-11 have been removed, the correspondence analysis of cluster E clearly separates another group (Fig 168). This does not correspond to a single group in the partition by bells, as half of the stamps appear in cluster 9a, and the other half appear in cluster 12. This group, cluster 12,[89] forms a parabola on further analysis. The significance of this is unknown, although three of the stamps were used by Johannes de Stafford (see §2.1.5).

Three clusters are isolated by the analysis of cluster E once clusters 1-12 have been removed (Fig 169). Cluster 13[90] splits into two further groups (Fig 170), with all the stamps in cluster 13a falling in cluster 24a of the previous analysis, and three-quarters of those in cluster 13b falling into cluster 24b. The other stamps in this group were allocated to clusters 24a and 30b in the previous partition, so the difference between these cluster solutions is subtle. Neither cluster 13a nor cluster 13b sub-divide on further analysis, although cluster 13b does form a rough parabola, the significance of which is unknown in the absence of documented stamps. Cluster 14[91] divides into three sub-groups on further analysis (Fig 171). Cluster 14a maps onto cluster 20 in the previous partition, and cluster 14c is similar to cluster 25. Cluster 14b, however, does not map directly onto one of the clusters from the previous solution, with the stamps occurring in clusters 26, 27, 29, 30, and 31 of that partition. None of these three clusters show any evidence of further sub-division on further analysis. Correspondence analysis of cluster 15[92] forms a parabola of stamps, which shows divisions on the map suggesting the existence of three sub-groups (Fig 172; and see also Fig 120 for the equivalent map of bells). These are directly equivalent to clusters 10a (15a), 10c (15b), and 10b (15c) in the previous partition. Only cluster 15a forms a horseshoe of stamps on further analysis, and no evidence of sub-division is apparent in any of these clusters.

Once clusters 1-15 have been removed, the first two dimensions of the correspondence analysis of the remaining stamps in cluster E is shown in Figure 173. Two further clusters are apparent, although the boundary of cluster 16 is rather diffuse and a more inclusive approach could see the boundary of this cluster drawn further along the first axis

[89] Cluster 12 includes stamps 1.0098, 1.0161, 1.0180, 1.0191, 1.0198, 2.0050, 2.0094, 4.0016, 6.0015, 8.0081, 8.0084, 8.0172, and 8.0185.
[90] Cluster 13 contains marks 1.0058, 1.0201, 3.0044, 3.0085, 4.0002, 5.0012, 5.0027, 7.0065, 8.0093, 8.0181, and 8.0184.
[91] Cluster 14 contains 24 stamps: 1.0019, 1.0033, 1.0056, 1.0105, 1.0118, 1.0154, 1.0281, 1.0287, 2.0003, 2.0115, 3.0047, 6.0010, 6.0018, 7.0001-4, 7.0040, 7.0072, 8.0033, 8.0052, 8.0099, 8.0235, and 8.0252.
[92] Cluster 15 contains 29 stamps: 1.0038-9, 1.0106, 2.0004-7, 3.0018-19, 3.0021, 3.0082, 5.0001-3, 5.0053, 5.0090, 7.0008-10, 7.0014, 7.0020, 8.0005, 8.0008, 8.0019, 8.0026, 8.0045-6, 8.0124, and 8.0212.

(possibly around +0.75). Cluster 16 is almost identical to cluster 11 in the previous analysis, including most of the stamps documented in use by the London foundries.[93] Over three further phases of analysis, it splits into six sub-groups. Cluster 16a appears on the analysis of cluster 16 (Fig 174) and is identical to cluster 11a in the partition by bells, including one of the trademarks of Thomas Lawrence (3.0017). A further three clusters are formed by the analysis of the remnant of cluster 16 after the removal of cluster 16a (Fig 175: see also Fig 125 for the equivalent map of bells). These are cluster 16b, equivalent to cluster 11f, cluster 16c, equivalent to cluster 11d, and cluster 16d, equivalent to cluster 11e (with one stamp also from 11d). Clusters 16e and 16f, equivalent to cluster 11j and 11k respectively, form on the further analysis of cluster 16b (not shown). Of these groups, cluster 16c contains the trademark of William Dawe/Founder (3.0014) and three more stamps which may have acted as trademarks (3.0086-8); cluster 16d contains the trademarks of Richard and Johanna Hille (3.0008-9), Johanna Sturdy (3.0010), John Kebyll (3.0007), and William Culverden (3.0015); and 16f contains the trademarks of William Chamberlyn (3.0001-2), his son Richard (3.0004), and T Bullisden (3.0011-12). Cluster 16f also includes two further stamps which may have acted as trademarks (3.0013 and 7.0016). None of these six sub-clusters of cluster 16 show any evidence of sub-division on further analysis, although the stamps in both cluster 16c and 16d form parabolas on analysis of these groups (see below Fig 191). Cluster 17,[94] formed by the same analysis as cluster 16, also shows no further division and is equivalent to cluster 15 of the partition by bells.

The next two steps in the analysis of cluster E form clusters 18, 19, and 20 (Figs 176-7).[95] No further divisions of these groups are apparent, with cluster 18 being identical to cluster 11g in the partition by bells, cluster 19 being equivalent to cluster 11b, and cluster 20 consisted of three stamps previously allocated to cluster 22 and one previously allocated to cluster 11e.

[93] Cluster 16 contains 117 types: 1.0001-12, 1.0029, 1.0031, 1.0034-7, 1.0041-4, 1.0077, 1.0081, 1.0083-5, 1.0089, 1.0091, 1.0102-3, 1.0107, 1.0123, 1.0204-5, 1.0221-2, 1.0301, 2.0002, 2.0016, 2.0041, 2.0049, 2.0101, 2.0104, 2.0107, 2.0125, 2.0129, 2.138, 2.0159, 3.0001-17, 3.0020, 3.0022, 3.0086-8, 4.0001, 4.0006, 5.0004-5, 5.0009-10, 5.0028, 5.0031-3, 5.0054, 5.0064-5, 5.0084-5, 5.0088, 5.0091-3, 6.0001, 7.0016, 7.0023, 7.0025-6, 7.0035, 7.0041, 8.0001-2, 8.0004, 8.0028, 8.0031-2, 8.0034, 8.0040, 8.0051, 8.0053, 8.0055-6, 8.0086, 8.0092, 8.0101, 8.0108, 8.0113, 8.0145, 8.0234, and 8.0249.

[94] Cluster 17 contains three types: 1.0239, 2.0095, and 8.0216.

[95] Cluster 18 contains 1.0192, 2.0133, 2.0136, 5.0040 and 8.0123: cluster 19 contains 1.0284, 7.0093, 8.0155, 8.0203, and 8.0242: and cluster 20 contains 2.0146, 5.0089, 6.0002, and 8.0035.

Two more clusters are clearly formed by the correspondence analysis of the remnant of cluster E, once clusters 1-20 have been removed (Fig 178). Cluster 21[96] is identical to cluster 17 in the partition by bells, and does not contain any sub-groups. Cluster 22 contains the marks used by the Bristol founders[97] and forms three more clusters on further analysis (Fig 179). Cluster 22a consists equally of stamps allocated to cluster 19b and 19e in the partition by bells, and forms a rough parabola on further analysis. So does cluster 22b, which consists equally of stamps allocated to clusters 19d and 19e in the previous partition. Cluster 22c consists of only two stamps and is equivalent to cluster 19c in the partition by bells. It should be noted that, although the larger Bristol group appears in both partitions produced by the correspondence analysis, the sub-groups formed from the maps of bells and stamps on further analysis of this group are very different.

The final analysis of cluster E (once clusters 1-22 have been removed) is shown in Figure 180. The stamps fall into three clear groups. Cluster 23[98] is equivalent to clusters 13 and 14 of the partition by bells and forms four sub-clusters (Fig 181). Cluster 23a is identical to cluster 14b, cluster 23b corresponds to cluster 14c, cluster 23c is identical to cluster 13, and cluster 23d corresponds to cluster 14d. None of these groups show further sub-division, and only cluster 23d forms a parabola of stamps on further analysis. As none of the stamps in this group can be tied to the documentary record, the significance of this map is unknown. Cluster 24[99] forms two sub-groups on further analysis (Fig 182). Cluster 24a contains only three stamps and is equivalent to cluster 19a from the partition by bells. Cluster 24b contains 12 stamps, which are divided between clusters 21b, 22, and 23 in the partition by bells. Again this cluster does not map directly onto one formed by the examination of the map of bells. It does form a parabola on further analysis, although the significance of this is unknown and no further sub-groups are identifiable. The final cluster formed by this analysis, cluster 25,[100] divides into three sub-groups (Fig 183). Clusters 25a and 25b each contain only two stamps, and are equivalent to clusters 16 and 14a in the partition by bells respectively. Cluster 25c contains 17 stamps and is equivalent to cluster 18. Although correspondence analysis of this group does form a parabola of

[96] Cluster 21 includes 1.0047, 1.0113, 1.0141, 1.0135, 1.0153, 2.0008, 8.0078, 8.0082, and 8.0111.
[97] Cluster 22 contains 40 stamps: 1.0013-4, 1.0109, 1.0122, 1.0158, 1.0163-4, 2.0010, 2.0053, 2.0064, 2.0071, 2.0073, 2.0078, 2.0080, 2.0105, 2.0109, 2.0113, 2.0119, 2.0145, 2.0153, 4.0013-15, 5.0024-5, 5.0035, 6.0013, 7.0052, 7.0062, 7.0064, 7.0074-6, 8.0043, 8.0102-3, 8.0195, 8.0225-6, and 8.0236.
[98] Cluster 23 includes 1.0015, 1.0073, 1.0097, 1.0119-20, 1.0203, 1.0235, 1.0258, 1.0271, 1.0273, 2.0060, 2.0076, 2.0084, 2.0089, 2.0163-4, 3.0029, 3.0069, 5.0051-2, 8.0010, 8.0130, 8.0141-2, 8.0146, and 8.0213.
[99] Cluster 24 includes 1.0065-6, 1.0090, 1.0267, 2.0077, 2.0085, 2.0106, 4.0007, 6.0019, 7.0102, 8.0020-1, 8.0029, 8.0088, and 8.0227.
[100] Cluster 25 contains 23 types: 1.0054, 1.0067, 1.0096, 1.0182-3, 1.0259, 2.0062-3, 2.0068, 2.0075, 3.0030-1, 3.0059, 4.0012, 5.0046, 5.0079, 6.0014, 8.0068, 8.0112, 8.0114, 8.0116, 8.0153, and 8.0231.

similar form to that produced in the map of bells (Figs 139 and 184), the gaps in the distribution of stamps are less clear and so in this partition this group remains undivided.

4.4 Discussion (classification)

Two levels of partition may be obtained from the correspondence analyses of bells. The first forms 35 clusters, and is revealed by the analysis of the entire data set (Fig 86) and by the successive 'peeling' of groups from cluster E (Figs 87, 89, 92, 96, 112, 119, 122, 131-2, 136, 138, 141, 145, 147-8, and 151-3). The second is formed by the full analysis of each group to a point where no further sub-division is apparent visually in the resultant maps. Sixty-nine clusters are identified by this approach, and are shown as single nodes in Figure 87.

The partition forming 35 clusters may be compared with the documentary evidence of foundries discussed in Chapter 2. Using the approach adopted in Chapter 3, two varieties of error can be observed. Type A errors are those of division, where bells known to be by the same founder or foundry occur in different clusters, and Type B errors are those of conflation, where bells known to be by different founders or foundries occur in the same group.

Type A errors relating to bells which have been allocated to foundries can be estimated in two different ways. First, the number of documented foundries that cast identifiable bells which are placed in more than one cluster by the partition can be calculated. By dividing this number by the number of documented foundries (with more than one bell) whose bells are placed into clusters by the partition, an estimate of the frequency of Type A errors can be provided. So, in this case bells by seven foundries are placed into more than one cluster by the partition and bells from all 12 foundries with more than one documented bells are allocated to clusters. Thus the Type A error of the partition using this method is 58.3% (7/12).

An alternative approach for estimating the frequency of Type A error in this analysis is to examine in detail the allocation of the 518 bells with independent evidence of foundry. Using this method, only 39 bells must be misallocated if each of the documented

foundries is to have bells in only one of the clusters identified in the partition, and so the Type A error of the analysis is 7.5% (39/518).

The errors of conflation, Type B errors, can be calculated in a similar manner. So, bells from 13 of the 14 foundries with documented bells occur in a cluster with bells from another foundry in this partition. This provides an estimated Type B error using this method of 92.9%. If the bells themselves are considered, however, only 11 have to be misallocated for each cluster to contain bells by only one foundry, and so the estimate of Type B error using this second method is only 2.1% (11/518).

The overall error for the partition into 35 clusters formed by the division of the correspondence analysis maps is provided by the minimum number of bells which must be misallocated for each of the clusters formed to contain bells by a single foundry, and for each foundry to have documented bells which fall in only one cluster. In this case, 42 bells have to be misallocated, and so the overall error of this partition is estimated to be 8.1% (42/518).

The error of the partition forming 69 clusters can be assessed in the same way against the documentary evidence for founders. For errors of division, bells by 17 of the 35 founders with more than one documented bell fall in more than one cluster in this partition, forming a estimate of Type A error of 48.6% (17/35). When considering the documented bells in detail, however, only 33 of the 368 documented bells have to be misallocated if bells by each founder are only to fall in one cluster. Thus, using this second method, the estimate of Type A error is 9.0% (33/368). For errors of conflation, bells by 38 of the 51 founders with at least one documented bell fall into clusters with bells by other founders, providing an estimate of Type B error of 74.5% (38/51). If all the documented bells are considered, however, 105 would have to be misallocated for each cluster to contain bells by only a single founder, so the Type B error is estimated to be 28.5% (105/368).

Once more, the overall error for the partition into 69 clusters formed by the division of the correspondence analysis maps is provided by the minimum number of bells which must be misallocated for each of the clusters formed to contain bells by a single founder, and for each founder to have documented bells which fall in only one cluster. In this case, 118 bells have to be misallocated, and so the overall error of this partition is estimated to be 32.1% (118/368).

Two levels of partition may also be obtained from the correspondence analyses of stamps. The first forms 29 clusters, and is revealed by the analysis of the entire data set (cf Fig 86) and by the successive 'peeling' of groups from cluster E (Figs 159, cf 89, cf 92, 160, 164, 166, 168-9, 173, 176-8, and 180). The second is formed by the full analysis of each group to a point where no further sub-division is apparent visually in the resultant maps. Fifty-three clusters are identified by this approach, and are shown as single nodes in Figure 159.

In comparing the partition which forms 29 clusters against the documentary evidence for stamps that can be tied to particular foundries, two approaches can be adopted. The first considers the 35 stamps from foundries with more than one trademark (Table 11). For errors of division, where stamps by a foundry appear in different clusters, this produces an estimate of Type A error of 0%, as all of the trademarks belonging to each particular foundry occur together in the same group. For errors of conflation, this method produces an estimate of Type B error of 2.8%, as mark 7.0078 from the Leicester foundry occurs in cluster 11 along with those used by the men of Chesterfield. The second method considers the 135 stamps which occur on bells from known foundries (Table 10). This larger sample provides estimates of 20.7% for Type A error, as 28 stamps must be misallocated for all the stamps used by particular foundries to occur in the same clusters, and 1.5% for Type B error, as only two stamps must be misallocated if every cluster contains marks only known to have been used by a single foundry. Using these methods, the estimated overall error for this partition in relation to documented foundries is 2.8% using only the 35 trademarks (1/35), or 20.7% using all 135 documented stamps (28/135).

Potential errors in the partition of the data by correspondence analysis forming 53 clusters can be calculated in an analogous manner. This assessment is limited by the small number of stamps which can be linked to distinct founders (Table 11). Unfortunately only trademarks, which probably did not routinely move between founders, can be considered to be diagnostic of particular craftsmen as a very high percentage of other documented stamps (62.3%) can be shown to have been in the hands of more than one worker. Only four founders can be assigned more than one trademark, and in all cases they occur together in the same cluster, so the Type A error of this partition is estimated to be 0% (0/8). Trademarks of 15 founders occur in clusters along with the trademarks of other

founders, and so the Type B error of this partition is estimated to be 57.7% (15/26). As there is no Type A error, this is also the estimate for the overall error of this partition.

It is apparent from these calculations that correspondence analysis has been much more effective at identifying groups relating to foundries than groups relating to particular founders. The overall errors for foundries for the partition of bells is estimated to be only 8.1%, and that for stamps to be 20.7%. In contrast, the overall errors for founders are respectively 32.1% for bells, and 57.7% for stamps. These figures are not entirely unanticipated, as it was expected that the geographical separation of foundries might be more clear-cut, and that the identification of smaller founder related groups might be complicated by questions of chronological succession (see above p163). Similarly, it is not unexpected that the partitions of bells are more effective than those of stamps, as these groups are expected to be more clearly separated.

In practice, undoubtedly the greatest drawback to the use of correspondence analysis for the identification of clusters is the absence of explicit criteria for cluster definition. For example, 18 maps are used for the identification of 35 clusters of bells. Some of these groups are clearly separated (ie clusters A-E, Fig 86; clusters 12 and 13, Fig 131; cluster 17, Fig 136; cluster 19, Fig 141; cluster 22, Fig 147; clusters 25 and 26, Fig 151). For others, although the existence of a cluster may be clearly apparent, its exact boundaries are hard to define (ie clusters 5-7, Fig 96). In other cases, it is not just the exact boundaries, but the very existence of a cluster that is open to doubt (ie cluster 10, Fig 119; cluster 14, Fig 132; clusters 23 and 24, Fig 148).

Having admitted that this approach to cluster definition is explicit only in its admission of subjectivity, the fact remains that nonetheless its partitions are given credibility by reproducibility. For example, the partition of the maps of stamps which forms 29 clusters, also allocates 1283 of the 1289 bells to these groups. Of these, 1057 (82.4%) are placed into groups which map directly onto those formed by the partition forming 35 clusters of the maps of bells. It is only cluster 14, and to a lesser extent, clusters 23 and 24, which have no direct equivalent in the latter partition. Indeed for some of the larger groups the similarity of the partitions is remarkable (89/89 bells for cluster 15 of stamps/cluster 10 of bells; 388/389 bells for cluster 16 of stamps/cluster 11 of bells; 126/127 for cluster 22 of stamps cluster 19 of bells). The correspondence analyses used are very similar, but not identical. They vary from the analysis of cluster E, once clusters 1-3 have been removed

(Fig 160), since the 'peeling' process and consequently the residual data matrices are different from this point. Given this, and the fact that the partitions of the maps of bells and stamps were undertaken without reference to each other, such similarity of results is striking.

The reproducibility of the clusters formed by correspondence analysis is also demonstrated by examination of further axes from the analyses already discussed. For example, in the analysis of bells shown in Figure 119 further dimensions appear to isolate cluster 12 (axes 3 and 4), clusters 14 and 15 (axes 5 and 6), and cluster 16 (axis 8).

In this application, the interpretability of the maps formed by the analyses has been informed by the wealth of documentary evidence outlined in Chapter 2. Nonetheless, some maps do appear simply to illustrate random fluctuations in the data (eg Fig 93 within a group of bells all of which were probably cast by John Tonne), and perfectly good interpretations can be postulated for entirely undocumented groups. Examine, for example, the geographical coherence of the bells which form cluster 17 (Figs 137 and 185).

Of the practical difficulties anticipated in the application of correspondence analysis to this data set, the reproducibility and interpretability of the results largely by-pass the potential problems. The 'peeling' approach adopted removes outliers into segregated groups, and the analysis is initiated again without them. This means that they do not define the future dimensions of the analysis. This approach also means that it is only necessary to consider a limited number of dimensions. This is fortunate as scree tests (eg Figs 94 and 103) do not to appear be particularly helpful in determining the number of axes that should be considered in this application, as most analyses show fairly steady falls in inertia with increasing dimensions. Nor has the suggestion that any axis with less than average inertia be excluded from consideration been particularly helpful, although this is largely because there are too many axes, and all those considered here have more than the average inertia (100/508=0.2%).

4.5 Further results and discussion (ordination)

Just as cluster definition from a correspondence analysis map can be in the eye of the beholder, so can the identification of a parabola of bells or stamps in a map. For the partition of bells forming 69 clusters, 38 maps have been classified as showing the horseshoe effect (Fig 87); and for the partition of stamps forming 53 clusters, 22 maps have been so classified (Fig 159). It must be admitted, however, that some of these are more convincing than others and the criteria for the identification of the effect are purely visual.

A number of the maps produced in this analysis show a tendency to form a parabola in the first two dimensions (or occasionally in the first and third dimensions), although other aspects of the map suggest that there is further variation. For example, Figure 89 shows the bells forming a smooth parabola, with only an outlying group characterised by the negative end of the second axis and a bifurcation in arc close to the centroid complicating the pattern. Such outliers are often found at the base of the parabola (eg Figs 92, 141-2, 147-8, 177, and perhaps 179).

Other maps also show tendencies to form parabolas, although concentrations of bells or stamps at the centroid mean that these are not "smooth". This effect is often seen in the 'peeling' of cluster E (eg Figs 96, 122, 138, and 166), where the most clearly segregated groups are spread along the axes with the rest of the data concentrated at the centroid. It does, however, also occur elsewhere in the analysis, such as in the correspondence analyses of clusters 7 and 11e in the partition of bells (Figs 106-7 and 127).

More even and continuous parabolas do occur (eg Figs 110, 114, 115, 117, 120, 125, 139, 149, 172, and 175), although gaps in the spread of bells or stamps along the axes may be apparent (eg Figs 95, 99, 108, 124, 137, 167, 171, and 183). The difficulty is to determine whether such gaps, or thinning in the distribution of points on a map, indicate the isolation of a cluster in the data or whether they indicate the phase boundaries of a chronological sequence. This is a more frequent interpretation of such maps in archaeological applications (McHugh 1999, 81; eg many of the applications in Jorgensen 1992).

Finally, there are maps where any parabola which may be identified is rather uneven (eg Figs 91, 109, 118, 126, 154, 161-2, and 165), and the very existence of the horseshoe effect may be open to doubt.

Having determined whether there is a convincing horseshoe apparent on a particular map, the next step is to suggest an archaeological interpretation. In this application, the validity of such interpretations may be assessed with reference to the documentary information presented in Chapter 2.

Of the 38 maps showing indications of the horseshoe effect formed during the analysis of bells, twelve occur during the partition of cluster E rather than from the analysis of a cluster forming a single node (Fig 87). Four of these maps occur during the partition of cluster E itself (Figs 96, 138, and 147-8). In each of these cases it is apparent that the variation shown around the parabola is explained by geographical factors rather than chronology. For example, Figure 147 shows a progression from foundries based in Lincoln (blue), to King's Lynn (black), Salisbury (green), Leicester (brown), and London (yellow). Eight more parabolas appear on maps which sub-divide the main foundry clusters produced by the partition. In these cases, the horseshoe effect seems to be explained principally by the descent of foundry lines and succession of workers within a business, although geographical and chronological factors also emerge.

Figure 99 shows the analysis of cluster 6, the axes being explained by the segregation of three sub-clusters. The bells in these groups were probably cast by craftsmen geographically or chronological separated from the main Brasyer business, based in Norwich in the fifteenth and early sixteenth centuries and represented by cluster 6d. Cluster 6a relates to Thomas de Wald (AD 1372) who worked in Yorkshire and the East Midlands (Fig 100), and was probably of the previous generation to Robert Fuller who founded the Brasyer dynasty (Chapter 2, fn 18). Cluster 6b probably relates to an undocumented founder working in southern East Anglia and Kent (Fig 102), and cluster 6c probably relates to Austen Bracker, who worked in East Anglia in the middle years of the sixteenth century . He may have succeeded to the businesses both of the Brasyer family and of the worker who cast the bells in cluster 6c. In any case, the progression shown on this map relates principally to the geographical separation of different related craftsmen working down the sea lanes of the east coast of England, and only incidentally to chronology.

Figure 115 shows the analysis of cluster 9b, the bells forming a neat parabola which it is tempting to interpret as showing the succession of the Heathcote family from

undocumented predecessors. Detailed inspection of the portion of this arc relating to the Heathcote family (Fig 115, inset) does not, however, support a strictly chronological interpretation for this map.

The correspondence analysis of cluster 10 also produces a map which shows clear evidence of the horseshoe effect (Fig 120). It is demonstrably incorrect to interpret this parabola as a chronological sequence, however, as sixteenth-century bells occur at both ends of the arc with fourteenth- and fifteenth-century bells falling at its base. Only cluster 10a, containing bells cast by William Hazelwood, produces a map which forms a parabola on further analysis, although there is some indication of the separation of bells by different founders on the maps produced by the other two groups (Figs 121 and 186).

By an integration of the available documentary evidence with the results of the correspondence analysis of cluster 10, the foundry sequence shown in Figure 187 may be proposed. The succession of the foundry after the demise of Roger Landen is obscure. He appears to have got into financial difficulties (see §2.2.4.4), and on Christmas Day 1453 "John Michell" received the gift of part of his goods, chattels, and debts (Anon 1941, 419). He was also paid £9 3s 4d on 4 January 1493 for casting the great bell at Henley-on-Thames (Burn 1861, 214). His bells are hard to identify, although he may have continued to use Landen's trademark, perhaps in its abraded form (3.0021), and have introduced new varieties of the Wokingham Lion (7.0009-10). There is some suggestion of this in Figure 188, although there is presently such confusion in the recording of these marks that it is unlikely that this issue can be further resolved without substantial new fieldwork in the relevant counties. The descent of the business after John Mitchell is even more obscure, although at least some of the foundry marks were in the hands of William Hazelwood, who had moved from Wokingham to Reading by 1495 (see Chapter 1, fn 8 and §2.3.2). After his death in 1507, the foundry came into the hands of John White (see §2.2.4.9). His bells are also hard to identify, although he may have reintroduced the Chertsey shield (3.0019) and be the founder of the dated bells at Easebourne, Sussex and Aldbourne, Wiltshire (3541 and 3751; Table 5; Fig 186, light blue). With the succession of the business from White to John Saunders we reach firmer ground, as they are even recorded working in partnership during the 1540s (see §2.2.4.9).

From the documentary evidence it seems clear that there was linear succession of craftsmen in charge of the Wokingham/Reading foundry from at least Roger Landen in

the 1440s to John Saunders in the 1550s. Why, therefore, is this chronological sequence not apparent in the parabola shown on Figure 120? What complicating factors are masking the fourth dimension? There appear to be two. First is the removal of the foundry from Wokingham to Reading by William Hazelwood, which seems to have been accompanied by the introduction of a whole suite of new stamps (eg 1.0106, 3.0082, 5.0053, 8.0046, and 8.0124) and the consequent use of a smaller range of his predecessors' marks. These new marks seem to have been largely abandoned by his successor, John White, who used more of the traditional stamps of the foundry. It is this increasing use of the older stamps in the tool-box which forms the second branch of the horseshoe in Figure 120 (cluster 10b). It is interesting that this appears to run into cluster 10c in reverse chronological order (ie bells by Saunders are closer to the centroid than those attributed to White). This may be linked to John Saunders' Catholicism (evidenced in the alarms and excursions of 1553, see §2.3.3), and a conscious attempt by him to cast bells in the "old style". Certainly even at this late date, all the bells attributed to him by the analysis are dedicated to saints, usually using the formula "Sanct[ae] [saint] Ora Pro Nobis".

Three further maps which form neat parabolas of bells are produced by the isolation of clusters from cluster 11 (Figs 124-5 and 127). Once more, however, the sequence illustrated is demonstrably not chronological. Identifiable bells by 13 documented London founders are shown on Figures 124 and 125, along with five other dated bells, and forty bearing the variant of the royal arms dated after 1413 (3.0005-6). Once more each branch of the parabola represents contemporary, parallel but connected, businesses apparently descended from a common ancestor. Cluster 11e contains bells by Richard and Johanna Hille, John and Johanna Sturdy, John Kebyll, Thomas Harrys, William Culverden, and Thomas Lawrence, spanning the years 1416 – 1539. The other branch, cluster 11f, contains bells by William and Richard Chamberlyn, John Danyell, T Bullisden, and again Thomas Lawrence, spanning the years 1440 – 1539. Bells by Lawrence, including the dated examples from Minchinhampton, Gloucestershire (1254) and Leaden Roothing, Essex (1062), also occur in cluster 11a, one of the sub-groups already identified (Fig 124).

Combining the documentary and iconographic evidence with the correspondence analysis maps shown in Figures 125-30, the foundry sequence shown in Figure 189 may be proposed. The founders represented in cluster 11d (Fig 126) seem to have originated

many of the stamps used by later London founders. Those bearing shield 3.0014 may be attributed to William Dawe or William Founder (§2.2.3). None of the other bells in this group can be dated. In Figure 189, the originator of the 'laver-pot' shields (3.0087-8) has been placed a distinct founder earlier than William Dawe/Founder, and the owner of the trefoil shield (3.0088) is suggested to be his successor. This is on the very shaky evidence of the map shown in Figure 126, with the additional information that the bells towards the negative end of the second axis of this graph have a higher proportion of inscriptions in the earlier Lombardic Capitals type (50%) than those towards the negative end of the first axis (25%)(Fig 8). Both of these groups have a larger proportion of inscriptions in Lombardic Capitals than bells bearing 3.0014 (17%), although a succession from the originator of the laver-pot shields, to the owner of the trefoil shield, to William Dawe/Founder seems unlikely on the basis of Figure 126.

Some of the stamps used by these founders (eg 1.0085) were inherited by Richard Hille, who is the earliest documented founder in the branch of the parabola in Figure 125 that forms cluster 11h. Figure 128 appears to suggest that a distinct cluster of bells not cast by Hille may also exist in this group. Since almost half of these bells bear inscriptions in Lombardic Capitals (21/43), they are probably by his predecessor (see above fn 36 for further details of this group, and their attribution to William and Robert Burford). Figure 128 does not provide any support for the suggestion that this group may be further sub-divided chronologically into those with inscriptions in Lombardic Capitals and those in mixed gothic (*pace* Deedes and Walters 1909, 13-15). Richard Hille was succeeded by his wife, Johanna, and then by John and Johanna Sturdy (§2.2.4.7). After the second Johanna's death, the fate of the business is once more obscure although it may have been in the hands of a founder called John Kebyll around 1480.[101] This sequence is not apparent from the analysis of the group containing the bells known to be by these workers (Fig 129), nor from the parabola shown in Figure 125. It is apparent, however, that as a group they were succeeded by William Culverden (Fig 127). William, like William Hazelwood, introduced a whole suite of new stamps (eg 1.0192, 2.0133, 2.0136, 5.0040, and 8.0123), most of which were rarely used by his successor, Thomas Lawrence, who had bought the foundry by 1522 (§2.2.3). For this reason, bells by Lawrence are more closely associated with cluster 11f, than with this group (Fig 125).

[101] The apparent connection of this group with bells bearing the initials 'TH' attributed to Thomas Harrys (c 1478-9) is probably a product of antiquarian confusion between the Wokingham Groat (7.0020) and the half-groat stamp used by the Sturdys, Culverden, and Lawrence (2.0107).

The second branch of the parabola shown on Figure 125, forming cluster 11f, contains bells by William and Richard Chamberlyn, T Bullisden, and Thomas Lawrence. They do not appear to fall in chronological order down the arc of the parabola. Figure 130 shows the further analysis of cluster 11f. A horseshoe effect may be discerned in this map, and the order of the bells in this may be broadly consistent with the documentary and iconographic evidence. It is unlikely, however, that either this ordering or this parabola would have been identified without the independent evidence. Since it has been, however, this map can be used to inform our understanding of the sequence of founders in this group. It appears that there must be some connection between both William Chamberlyn and the owner of medallion 7.0016, as these appear to be contemporary founders. The intermingling of their bells in this map may suggest that John Danyell was the owner of this medallion, rather than being his predecessor (*pace* Tyssen 1915, 38-42), although it should be noted that the medallion does not occur on any of the bells bearing the 'ID' initials. Danyell appears to have been succeeded by a founder with the initials 'IW' who used shield 3.0013, whilst William was succeeded by his son Richard on his death in 1474. Both businesses then seem to have been united in the hands of T Bullisden, who was himself succeeded by Thomas Lawrence.

From the documentary evidence it seems clear that there were at least two, and sometimes three, separate lines of founders operating in medieval London. This may explain why the parabola apparent in Figure 125 does not appear to relate to the chronological succession of bells. Rather, it demonstrates the connections between the difference workshops. Some such connections have been proposed in Figure 189, although these will undoubtedly be clarified once further documentary research is undertaken, particularly on the founders working in the later fifteenth century. The outlying groups identified from cluster 11 (Fig 123) appear to relate to the thirteenth and early fourteenth-century predecessors of the later medieval London foundries (cluster 11b; see above), and to Thomas Lawrence (cluster 11a) who finally united both foundry lines.

Figure 139 shows the map of the first two dimensions of the correspondence analysis of cluster 18. The significance of this map is poorly understood. It is possible that a chronological sequence is shown by the parabola of bells, with 'it' being a predecessor of Robert Norton, and Robert Hendley his successor. On the other hand, there are noticeable differences between the distribution of bells in each of the sub-clusters identified in this

map (Fig 140), and so the parabola could equally show a geographical separation between the successor of Norton in Exeter (cluster 18a) and in Gloucestershire (cluster 18c).

In contrast, the untidy parabola of bells shown of Figure 142 probably does relate to different branches of the Bristol foundry. Cluster 19e contains the bells of Thomas Gefferies (1518-45) and his son Harry (1545-*c*60), and so the base of the parabola must include the latest bells in the sequence. This means that clusters 19b and 19d must both relate to the Geoffries' (and probably 'rt's) predecessors. The map of the bells in these groups suggests that they were all cast in or around Bristol (Fig 190).

So, of the 12 parabolas of bells so far considered from the maps formed by the correspondence analyses of bells, four are clearly to be interpreted on the basis of the geographical separation between different foundries, and eight relate principally to the non-linear succession of workers within particular foundries.

Of the 69 clusters formed by the partition of bells, 26 produce maps which show parabolas of bells (Fig 87), and 12 contain more than three documented bells and so can be compared with the evidence outlined in Chapter 2. Of these, half also produce maps showing the horseshoe effect.

Analysis of cluster 2 forms a rather diffuse and uneven parabola, with a substantial gap in the distribution of bells along the first axis (Fig 91). It is possible that the dated bells do, however, fall in chronological order along this arc, although as one of the dates is simply a *terminus post quem* this cannot be demonstrated conclusively. This order is also produced by the 'seriation' of the cluster, using only the first component of the correspondence analysis (also performed using BASP for Windows v5.4; Scollar *et al* 1985)(Fig 191).

The map of cluster 3 is more complex (Fig 93). In the lower part an uneven arc of bells known to be by John Tonne is formed (shown in yellow), and the four dated bells along this do appear to fall in an order consistent with the dates cast upon them. The bell at Downe, Kent (1696), however, is dated 1511. This not only falls out of sequence, but forms an outlier at the base of the arc. This may be explained by further sub-division in the data, as proposed by Stahlschmidt (1887, 49), who suggested that this bell was by a predecessor of Tonne. In the 'seriation' of this cluster (Fig 192), the Downe bell is placed

after the bells cast by John Tonne in 1540 (ie at the wrong end of the Tonne sequence). This bell must be misplaced if the parabola in Figure 93 represents a correct chronological sequence, and so the error of this ordering is 20% (1/5).

Cluster 6d contains bells by four known founders from Norwich, and five further documented bells. Maps of the axes of the correspondence analysis are shown in Figures 104 and 105, and the 'seriation' of the group in Figure 193. The orderings produced by reading around the parabolas of bells shown on Figures 104 and 105 are rather different from each other, and from that produced by the seriation (although this ordering can be seen simply by inspecting the relative order of the bells along the first axis of either map). If these orders are strictly chronological, then the errors are 24% (5/21) for those produced from the maps (Figs 104-5), and 33% (7/21) for that produced from the seriation (Fig 193).

Two of the sub-groups of cluster 7 contain more than three documented bells. The orders suggested by the two analyses of cluster 7a (Figs 108 and 194) are slightly different, but both are consistent with the limited number of dated bells in the group. The same order is suggested by the two approaches for the analysis of cluster 7b (Figs 109 and 195), although two of the five bells must be misallocated if the order is truly chronological (40%).

Fifteen bells bearing the trademarks of members of the Heathcote family of Chesterfield appear in cluster 9d. These appear in an order consistent with the documentary evidence around the parabola shown in Figure 118, although one of the bells by Ralph I must be misplaced if the order suggested by the first axis of the correspondence analysis alone is to be accurate (Fig 196). In this case the error of this ordering is 7% (1/15). In cluster 10b, three bells by John Saunders of Reading appear with two other dated bells. Although the bells do not form a parabola, on this map (Fig 186) they fall in the same accurate chronological order as in the seriation (Fig 197).

Turning to cluster 11, three bells by documented founders appear in cluster 11b. They fall in the correct chronological order in the map of this group, although the bells do not form a parabola (Fig 198). The seriation of this cluster (Fig 199) produces the same correct chronological ordering. Nineteen documented bells appear in cluster 11h, all but two by Richard Hille. The correspondence analysis of this group does not form a parabola (Fig

128), and so the order produced by reading along the first axis is the same as that produced by the 'seriation' of the group (Fig 200). This sequence is entirely consistent with the documentary evidence (but see above fn 35). A similar pattern is seen in the analysis of cluster 11i, which contains 55 documented bells. The first two dimensions of the correspondence analysis of this group does not form a parabola either (Fig 129), and so the order produced is the same as that from the 'seriation' of the cluster (Fig 201). In this case, 23 of the bells must be misplaced for the ordering to be a correct chronological sequence (42%). The bells in cluster 11k do form an approximate horseshoe (Fig 130), although the chronological ordering in this map does not follow the parabola but runs along the first axis. This ordering, also produced by the 'seriation' of the group (Fig 202), requires that 13 of the 78 documented bells in this group be misplaced if the order relates precisely to the chronological sequence known from the documentary evidence (17%). This assessment takes account of the fact that William Chamberlyn (AD 1440 – 74) and John Danyell (AD 1454 – 60), contemporary craftsmen, are both known to have cast bells in this cluster.

Finally, cluster 19e contains 27 bells by identifiable founders. The first two axes of the correspondence analysis of this group do not form a parabola, although there is a hint of a chronological sequence along the first axis (Fig 143). This is shown more clearly by consideration of the first axis only (Fig 203), which shows that four bells must be misallocated for the ordering to be consistent with the documentary evidence (15%).

Of the twelve clusters of the partition of bells by correspondence analysis with sufficient documentary evidence for the validity of a chronological interpretation of the ordering to be made, six clusters mapped parabolas of bells from which an ordering could be obtained. Of these orderings, three were entirely consistent with the available documentary evidence, and two needed approximately one fifth of the documented bells to be misplaced for an accurate ordering to be obtained (Table 37). Sequences of bells could be obtained for all of the clusters using 'seriation' by the first axis of the correspondence analysis (Scollar *et al* 1987: Ihm 1981). Five of these orderings are entirely consistent with the documentary evidence, with three misallocating around one fifth of bells, and three misallocating two fifths (Table 37). There does not seem to be a relationship between the estimated error of an ordering and the 'compactness' of the seriation (as measured by the Spearman's Rank Correlation coefficient (ρ): Hertzog and Scollar 1988: Table 37). In the two cases where the errors of the orderings produced by

consideration of one or two axes of the analysis differ, the order from the parabola is marginally superior (Table 37).

Turning now to the analysis of stamps, much less external information is available to assess the validity of the maps produced by the correspondence analysis. Of the 53 clusters of stamps formed by inspection of the maps from the correspondence analysis of stamps, only three contain more than three stamps which can be independently dated. Nonetheless, agreement between these absolute dates and any relative sequence suggested by the maps does provide an indication of the validity of a chronological interpretation of these results.

Five trademarks appear in cluster 11 of the partition of stamps. The overall analysis of this group (Fig 167) does form an untidy parabola, although the five documented marks all appear near the base of the arc and do not fall in chronological order. In the map of the correspondence analysis of sub-cluster 11b (Fig 204), the four trademarks belonging to members of the Heathcote family of Chesterfield (§2.2.4.3) do fall in the correct chronological sequence, although that of Thomas Bett of Leicester (§2.2.4.1) does not. The same ordering is produced by consideration of the first axis only (Fig 205), so the estimated error of this sequence is 20% (1/5).

Eleven trademarks, belonging to nine documented founders, appear in cluster 16 of the partition of stamps, along with five more stamps that are probably trademarks, but which cannot be allocated to particular founders from the documentary record. Analysis of this group, once the outlying cluster 11a has been removed, forms a convincing parabola in the first and second dimensions (Fig 175). This is, however, demonstrably not a chronological sequence as the late fourteenth-century trademark of William Dawe or William Founder (§2.2.3) occurs at the base of the arc, with fifteenth- and early sixteenth-century founders in each arm. The founders in cluster 16b also do not fall in chronological sequence on this map, with the shield of Bullisden falling rather earlier than anticipated. The foundry marks in cluster 16d occur close together, but if anything there is a consistent sequence in reverse, with the latest marks occurring closer to the centroid.

On further analysis, the trademarks of the three documented founders in cluster 16f do not fall into the correct chronological sequence (Figs 206-7). Shield 3.0011, attributed to T Bullisden, falls earlier than expected and produces an estimated error of these orderings

of 20% (1/5). The five trademarks occurring in cluster 16d do, however, fall in a chronological sequence on the map of the first two dimensions of the correspondence analysis of this group, forming an untidy parabola (Figs 208). The ordering produced by consideration of the second dimension is slightly different (Fig 209), and requires that one trademark be misplaced if the sequence is to be accurately chronological (20%; 1/5).

Generally, the maps of stamps from this correspondence analysis do show accurate chronological sequences (Table 38). In the two cases where there is a simple linear succession of founders (the Heathcotes of Chesterfield, cluster 11b; and the Hille/Sturdy line in London, cluster 16d), this is identified accurately. Connections between foundry lines complicate the picture, both with the (undocumented) association between Thomas Bett of Leicester and the Heathcotes (Fig 204), and the links between workers in London (Fig 206). Again, in situations where an ordering is available following a parabola on a map in two dimensions, this ordering is marginally more accurate than that produced by 'seriation' using one axis of the correspondence analysis (Table 38).

For analyses within the series partitioning cluster E, maps showing the horseshoe effect appear to display variation relating to the succession of foundry lines, rather than strict chronology (Figs 167 and 175). It is also possible to find geographical succession around the arc of a parabola. For example, Figure 160 shown a progression from the foundries of East Anglia to those of the North, and Figure 169 shows a progression from Wokingham, through London, and the foundries of the South-West, to those of the Midlands.

4.6 Conclusions

It has been possible to identify clusters in the maps produced by the correspondence analyses of this dataset. This has been done on two levels, first by considering only those clusters formed from the 'peeling' of the original data matrix, and then by considering all those formed by the subsequent re-analysis of these groups (see Figs 87 and 159). The accuracy of these partitions has been assessed against the documentary evidence outlined in Chapter 2. On this basis the overall error of the partition of bells forming 35 clusters is 8.1% when compared to the information on foundries, and the overall error of the partition of bells forming 69 clusters is 32.1% when compared to the information on particular founders. For stamps, the overall error of the partition of stamps forming 29

clusters is 20.7% when compared to the information on foundries, and the overall error of the partition of stamps forming 53 clusters is 57.7% when compared to the information on particular founders.

In both cases, the partitions of bells are more accurate than the partitions of stamps. This may be because, in reality, the clusters of bells are more clearly separated than those of stamps. For foundries, the partitions identified by the correspondence analyses are the most accurate identified in this study, although some of the methods of cluster analysis are more successful at identifying groups of bells or stamps relating to particular founders (Table 36).

Despite the informal, visual, approach to cluster definition adopted for the interpretation of the maps, the resultant partitions do appear to be reproducible. The partition of bells forming 35 clusters allocates 82.4% of bells to the same clusters as the partition of stamps which forms 29 clusters. Some of the clusters which form later in the sequence of 'peeling' are also isolated by further axes of earlier analyses. For example, the map of bells which separates cluster 10 in the first two dimensions (Fig 119), also isolates cluster 12 in the third and fourth dimensions, clusters 14 and 15 in the fifth and sixth, and cluster 16 in the eighth (Fig 87). Further support is also provided for the validity of the partitions produced by the correspondence analyses on the basis of the interpretability of the resultant clusters. Not only are they in good accord with the external documentary evidence, but the groups of bells they contain also have a geographical coherence (eg cluster 17; Fig 185).

Chronological sequences of bells and stamps have also been identified in the maps produced by the correspondence analysis. It must be admitted, however, that some of the "neatest" parabolas formed are certainly not explained by chronology. Rather geographic separation of related foundries, and the complex succession of foundry lines have both also been revealed by the maps.

Of the 12 maps showing the horseshoe effect which are formed during the partition of cluster E by bells, none have a convincingly chronological interpretation. In contrast, the sequences revealed by the further analyses of the clusters formed (Fig 87) appear to be principally showing chronological variation in the data (Table 37). Overall the maps for these groups need to misplace 19 of the 126 documented bells which they sequence

(15%) for the orders to be entirely consistent with the external evidence. If only the first axis of each analysis is considered, then 51 of the 239 documented bells (21%) need to be misplaced.

There are far fewer documented founder marks, and only two maps form parabolas of stamps during the partition of cluster E by stamps (Fig 159). Again, these do not have a convincing chronological interpretation, but seem to be explained by the succession of different foundry lines. Only three clusters have sufficient independent evidence for an assessment of the chronological validity of the sequences produced by further analysis to be made. Overall the maps for these groups misplace none of the five documented stamps which they sequence (0%). If only the first axis of each analysis is considered, however, then three of the 15 documented stamps need to be misplaced (20%; Table 38).

Accurate chronological series do lie within the maps produced by the correspondence analyses, but accurate geographical series, and series based upon the interactions of different foundry groups also exist. In the absence of external information, it is difficult to know when a map indicates the need for further partition, or when a chronological interpretation is appropriate.

CHAPTER 5

FURTHER DISCUSSION AND CONCLUSIONS

"All models are wrong, but some are useful" (Box 1979, 202).

All the methods discussed in this study are models in the sense that they attempt to provide a simplified view of the data which is archaeologically meaningful (Voorrips 1987, 68). They are therefore, almost by definition, "wrong", as it would be very remarkable if any complex society from the past – or indeed system existing now in the real world – could be *exactly* represented by a simple model.

Having admitted that "all models are wrong", we need to consider which "are useful". In this application the models have been compared with independent information, which relates to the *specific purpose* for which they were created. By this means it is possible not only to assess which models are "wrong", but to provide a quantitative assessment of how "wrong" each one is. This enables us to be explicit in our assessment of what George Box (1976, 792) has called *worry selectivity*. All models are wrong, but we need to decide what about them is *importantly* wrong.

5.1 The standard

Before the accuracy of the results of the various mathematical approaches to classification and ordination applied in this study can be assessed, however, it is vital to determine what is known about the founders and dates of individual bells or stamps in the data matrix. The essential link is that between people who appear in the documentary record and the physical bells. Chapter 2 re-examines these links according to explicit criteria, deconstructing over a century and a half of antiquarian study into medieval bell-founding. It is the critical reassessment of this material that is so vital to this study. Although perhaps a third of the documentary references to the various founders cited in Chapter 2 were previously unknown to campanists, very few new founders have been identified. It has been more a case of fleshing out the skeletal biographies of those already known.

In Chapter 2, recorded bells have been assigned to 89 different founders. Bells by 51 of these founders occur in the incidence matrix used for the analyses in Chapters 3 and 4

(Appendix 3). These 51 founders represent approximately one fifth of the craftsmen discovered in documentary sources who probably cast bells (51/215=24%).

In total 129 named founders are certainly known to have cast bells, either because they appear in a document specifying so, or because there is record of one of their bells. Of these founders, however, only 35 (27%) are described in terms which specifically identify them as bellfounders ('bellfounder', 'belmaker', or 'belytere' in various forms; Fig 210). Another 18% are described using allied terms which identify them as workers in bronze ('brasier', 'founder', and 'potter'), but 41% are not described by trade at all (even though they may appear in a context which makes it clear that they were casting bells), and 27 have not been traced in documents at all. The other three bellfounders are described respectively as a gunfounder, a wheelwright, and a fishmonger![1] There is a clear trend through time in the use of these terms, with 'belytere' and 'potter' predominating before 1350, and 'bellfounder', 'belmaker', 'brasier', and 'founder' becoming increasingly common thereafter (Fig 211).

From this it is apparent that there must be bells in the incidence matrix which were cast by founders who do not appear (or have not be identified) in the documentary record. Before the Black Death, these are likely to be described as 'belytere' or 'potter' or simply not to appear in surviving documents. On the basis of bells which were cast with the names of their founders (70% of which are fourteenth-century in date; see §2.1), there are probably as many founders as yet undocumented as are currently known from the written sources. In the later fourteenth and fifteen centuries, further bellfounders are probably described using the terms 'founder' or 'brasier'. Campanists have been relatively thorough in their search for 'bellfounders' and 'belmakers', although there may well be a few more of these to be discovered, particularly in poorly indexed archives.

[1]Peter Baude only appears in documents as a 'gunfounder' (see §2.1.8); John Kebyll is the wheelwright (see §2.2.3); and Henry Jordan was a fishmonger. He married the daughter of Richard and Johanna Hille, and inherited the foundry in Johanna's will (Barron 1994, 107; Walters 1912, 375). In 1448, he attempted to persuade John Vyncent to break his indentures with John Sturdy (Barron 1994, 109), although the foundry was certainly active as he was paid £40 for casting bells for King's College, Cambridge in 1465 (North 1883, 48). In 1456 he served as a Common Councilman for Portsoken ward (Barron 1994, 109). His will, in which he is described as a 'fishmonger', was drawn up on 15 October 1468, and enrolled in the Hustings Court in November 1470 (Stahlschmidt 1884, 60-70; Sharpe 1890, 543-4).

It is also apparent that there are numerous documented founders currently known whose bells either are not represented in the sample which has survived, or which cannot be identified. There are at least 40 of these founders, and more probably around 150.[2]

Bells from fourteen foundries can be identified in the incidence matrix which has been used for the analyses presented in Chapters 3 and 4. These are not the fourteen major foundries apparent from the documentary record, however (Fig 23), as none of the bells from the foundries in Gloucester, Worcester, and Nottingham can be identified. It is very unlikely that no examples from these major centres of production survive. The number of bells which can be attributed to each foundry also varies considerably. Whereas 218 London bells can be identified, only four examples are apparent from the second largest foundry at York. Whereas 49 bells bear the Bristol ship, or can be attributed to craftsmen working in Bristol, only a single bell by John Barber can be allocated to the Salisbury workshop.

Of the minor foundries, bells from three can be identified in the incidence matrix (Aish Priors, Somerset, Lincoln, Lincolnshire, and Toddington, Bedfordshire). Fifteen other foundries appear in the documentary record, although it is possible that there may be no surviving examples from a number of these. For example, "Roger de Tauntone, bell-founder, born in Bristolle" owed 10s to the burgesses of Dorchester, and was working in Bridport in 1280 (HMC 1887, 489; Walters 1912; 196, 382; Walters 1929, 254). As a lone craftsman working at such an early date, it is perhaps likely that no example of Roger's work survives.

5.2 Classification

The results of four approaches to the classification of the data matrix of bells and stamps are outlined in Chapters 3 and 4. The accuracy of these partitions has been assessed in relation to the documentary and iconographic information, which can be firmly related to the incidence matrix and is set out in Chapter 2.

[2]Of the named 129 founders certainly known to have cast bells, recorded examples of 89 craftsmen have been identified in Chapter 2. There are, however, at least 240 founders documented who are likely to have cast bells.

Table 39 provides a summary of the estimated accuracy of each method in identifying clusters relating to founders and foundries. In each case, the most accurate partition produced by a technique, as assessed against the independent information, is considered.

Single-link cluster analysis produces partitions of bells in which approximately three-quarters of bells are accurately placed into groups which relate to particular founders and foundries. The partition of stamps achieves a similar degree of accuracy in relation to founders, but is much poorer in relation to foundry groups. The partition at a similarity level of 0.5 provides the most accurate cluster solution for bells in relation to documented founders, with an estimated error of 29%.

The relatively good performance of single-link cluster analysis in this study is not entirely unexpected, especially in relation to the clustering of bells. The technique is designed to identify a hierarchy of clusters within the data, and groups of bells relating to founders are expected to join to form foundry clusters, thus forming a hierarchy. The clusters of bells are expected to be non-overlapping and comparatively well-separated, although those for stamps are not. It is, therefore, rather more surprising that the technique has managed to partition three-quarters of stamps into clusters which accurately relate to particular founders, than that it has done so for bells. Single-link cluster analysis is particularly suited for the identification of clusters which are serpentine in shape. This may be reflected in the success of the technique in identifying clusters of bells relating to foundries (Table 39). In contrast, the poor accuracy of the partition of stamps relating to foundries may mean that the technique is not robust in the face of clusters which, in reality, overlap.

In this study, single-link analysis has proven relatively effective, and the common problems of the technique have not been irresolvable. Since a certain level of inaccuracy and 'noise' in the data matrix is expected (see §1.3.4), and the technique is sensitive to such errors, perhaps more difficulties would have been anticipated. 'Chaining' has also not occurred to an extent that the results are seriously compromised. Indeed, it has been argued above (§3.4.3), that 'chaining', when it does occur, is actually revealing meaningful links in the data. In an application which had no external evidence, however, the selection of the most appropriate level of partition would not have been obvious (eg see Fig 38). In this study, however, it has been possible to select the most appropriate level of similarity for the partitions on the basis of the independent information. There is

some indication, however, that the concept of a 'correct' level of partition is actually misleading. Meaningful groups in the data are identified at a number of different levels of similarity, and indeed the examination of how different groupings combine and divide at different levels in the hierarchy may in fact be informative (see §3.4.3 and Fig 59).

K-means cluster analysis has been much less successful in identifying clusters of bells or stamps which relate to particular founders or foundries (Table 39). The partitions relating to founders allocate perhaps two-thirds of bells or stamps accurately, but the partitions relating to foundries allocate less than half accurately. For foundries, k-means cluster analysis has produced the least accurate clusters of bells and stamps of all of the techniques considered. It has also performed consistently badly in identifying clusters relating to particular founders.

It seems that the data fit the k-means model particularly poorly. Specifically the implicit use of the simple matching coefficient, which gives as much weight to joint absences as to joint presences, is inappropriate for this data. This is for two reasons. First, a founder could only use two stamps together on a bell if both were in his tool-kit. In contrast he could have chosen not to use them together if he did possess both, or perhaps he could not use them together because he did not possess them. Joint presences are therefore more important than joint absences. In this dataset, which demonstrably has a large proportion of missing data (see §1.3.4), joint absences could also be simply an artefact of recording.

It is also possible that the results of the k-means clustering are affected by violations of the assumption that the clusters are spherical. This may be reflected in the slightly more accurate identification of cluster solutions relating to founders, compared to those relating to foundries (Table 39). Foundry clusters are expected to be serpentine in shape, clusters relating to founders might be slightly more globular.

K-means cluster analysis has performed so poorly in this application that the difficulties of determining the number of clusters to be considered are not relevant in practice. It should be noted, however, that the percentage errors of fit for the analyses of both bells and stamps show no clear 'elbows' which might suggest appropriate numbers of clusters (see Figs 64 and 69). In the absence of independent information, this might provide an indication that this technique is not appropriate for the analysis of this incidence matrix.

In general, shared near neighbour cluster analysis has been more successful in identifying clusters of bells and stamps relating to particular founders and foundries than k-means cluster analysis, but less successful than single-link cluster analysis (Table 39). The partitions relating to founders are more accurate than those relating foundries. Two-thirds of bells are allocated accurately to clusters relating to particular founders and foundries. A similar level of accuracy is achieved for the partition of stamps forming clusters relating to foundries, although the cluster solution for stamps relating to founders is rather better. The partition at a threshold of 9 (where k=12) provides the most accurate cluster solution for stamps in relation to documented founders of all the techniques considered in this study, with an overall estimated error of 16.7%.

Shared-near neighbour cluster analysis shares a number of characteristics with single-link cluster analysis that make it appropriate for this application. In particular it is designed to find the hierarchical groupings which are expected in this data. It also defines non-overlapping clusters, although, given the accuracy of the partition of stamps relating to founders, it may be relatively robust against the occurrence of overlapping groups. It is certainly particularly designed to deal with non-spherical clusters, such as those formed when stamps are correlated (see §3.6). It is this characteristic of the technique which might explain its comparative success at defining clusters of stamps.

The shape of the clusters formed by shared near-neighbour cluster analysis is influenced by the number of neighbours (k) considered by the analysis. Small values find elongated clusters, such as the serpentine foundry groups expected to be present in this data, and large values search for more globular clusters. In fact, for both bells and stamps, the number of neighbours considered for the most accurate partition relating to foundries is larger than that for the most accurate partition relating to founders. This is unexpected, and it may be that the technique is relative insensitive to the number of neighbours considered in the analysis.

In contrast, the level selected for the partition of the dendrogram is critical. For clusters relating to founders, this seems to be indicated by the maximum number of clusters formed (see §3.6.3).[3] No such trend is apparent for the identification of a suitable level of

[3]Unfortunately, in the analysis of bells, the maximum number of clusters is not reached in this application (as this is more than the 99 clusters handled by the software). It is possible, however, that if these solutions were calculated, they would produce clusters of bells which would relate to documented founders relatively accurately.

partition for the formation of clusters relating to foundries and, in the absence of independent information, it is not clear how appropriate levels could be selected. It should be noted that, in this application, in all cases the default threshold for partition suggested by BASP for Windows (v5.4) was far too low.

The 'peeling' approach to the interpretation of the maps produced by correspondence analysis has been highly effective in identifying groups of bells and stamps which relate to particular foundries (Table 39). The partition of bells producing 35 clusters provides the most accurate cluster solution for bells in relation to documented foundries, with an estimated error of only 8.1%. The partition of stamps producing 29 clusters provides the most accurate clustering of stamps in relation to documented foundries, with a rather higher estimated overall error of 20.7%.

The success of correspondence analysis in identifying these clusters seems to be because the foundry groups are well separated on the maps because of the geographical separation of the workshops. It is this geographical trend, uncomplicated by the complexities of foundry lines found on further partition, which separates the clusters. The partition of bells relating to foundries may be more accurate than the equivalent partition of stamps because the clusters of bells are more clearly separated (each bell was cast by one foundry, stamps could and did move between foundries).

Once the dominating geographical separation between foundry groups has been revealed, the maps produced by the correspondence analysis reveal a range of different sources of variation in the data. In addition to further geographical divisions (see, for example, the discussion of cluster 6 in the partition of bells; §4.2), there may be further segregation of groups of bells relating to particular founders (eg Fig 127), or chronological trends (eg Fig 118), or trends relating to the succession of a workshop between different craftsmen (eg Fig 120). It is this complexity which may explain why correspondence analysis has been less successful in identifying clusters of bells and stamps relating to founders (Table 39).

In practice, the visual definition of clusters seems to be effective. The independent partitioning of the maps of bells and the maps of stamps allocated 82.4% of bells to equivalent clusters, demonstrating that the clusters were reproducible. The relatively low estimated errors of the partitions (Table 39) also demonstrate that the clusters can be

interpreted. The supposed vulnerability of correspondence analysis to outliers is not a concern when using the technique to map groups in the data, as it is this very attribute of the method that allows clusters to be distinguished. This approach is also effective because it does not produce alternative partitions (except perhaps in cases where cluster boundaries are unclear, eg Fig 96), and so the problem of selecting the 'correct' solution is not applicable. It is necessary, however, to know enough about the data from external sources to be able to interpret the resultant maps.

Having determined which models are "wrong", and suggested some reasons why each is "wrong" for this particular application, we must consider in which ways these models are *importantly* wrong.

For the cluster solutions of bells relating to founders, there is an impressive degree of consistency between the partitions produced by single-link cluster analysis, shared near-neighbour cluster analysis, and correspondence analysis. The allocation of bells to clusters provided by the single-link cluster analysis of bells, partitioned at a similarity level of 0.5, has been compared with the allocation of bells to clusters by the other techniques. This demonstrates that 74.8% of the bells partitioned into clusters by both the single-link cluster analysis and the correspondence analysis, appear in equivalent clusters. For shared near-neighbour cluster analysis, this value is 72.1%. Basically, these three techniques are revealing the same core variation in the data. Their agreement, despite the great variety of the approaches, suggests that they are revealing something which is, fundamentally, not "wrong". The differences between them are not, in George Box's terms, *important*.

A different picture is presented by k-means cluster analysis. In this application, it partitions only 49.2% of the bells in the solution from single-link cluster analysis into equivalent groups. This is not a negligible proportion, and certainly suggests that the k-means analysis is identifying some of the structure in the data, but it is much less. This suggests that, for this application, the k-means model is more *importantly* "wrong". This seems to be because the technique implicitly uses an association coefficient which is inappropriate for these data.

There is rather less agreement between the cluster solutions for bells relating to foundries. By a similar comparison, in this case with the partition by correspondence analysis which

produces 35 clusters, 59.9% of the bells are allocated to equivalent clusters by the shared near-neighbour cluster analysis and 62.5% of the bells are partitioned into equivalent clusters by the single-link cluster analysis. Again, fewer bells are allocated to equivalent clusters by the k-means cluster analysis, only 31.6%.

In this case, the differences between the results from different techniques relate rather to the very accurate identification of foundry groups through correspondence analysis, rather than particularly inaccurate classifications produced by the single-link and shared near-neighbour cluster analyses. These methods do not appear to be *importantly* "wrong" for this application, rather correspondence analysis is *importantly* "right"! As correspondence analysis is fundamentally a technique for mapping complex data in a reduced number of dimensions, and there is no specific mathematical model with which to compare the data, it is difficult to say why this should be so. It may be related, however, to the clear separation of foundry clusters, with a limited number of stamps passing between workshops. Again, k-means analysis has produced a solution for the classification of bells into groups relating to foundries which is even more *importantly* "wrong". Although fundamentally related to the use of an inappropriate association coefficient, this particularly poor performance may be because foundry groups are even less spherical in shape than those relating to founders, and k-means cluster analysis is also sensitive to violations of this assumption.

Turning to the partition of stamps, a similar pattern is observed. For the partition of stamps forming groups which most closely relate to particular founders, there is good agreement between clusters produced by single-link cluster analysis and shared near-neighbour cluster analysis, with 78.7% of stamps falling in equivalent clusters. The agreement between the shared near-neighbour cluster analysis and correspondence analysis is also good, with 69.1% of stamps falling in equivalent clusters. For k-means analysis, however, only 13% of stamps fall into equivalent clusters.

The similarity of the partitions produced by the single-link and shared near-neighbour cluster analyses is reflected in the similarity of the estimated overall errors of these partitions in relation to documented founders (Table 39). The difference between the partition produced by shared near-neighbour analysis and k-means analysis is surprising, given the relatively low level of error seen in the latter solution (27.6%). The similarity of the partition derived from correspondence analysis is also surprising, given the very high

estimated error in that partition (57.7%). It seems likely that these figures are artefacts of the limited number of trademarks available for the assessment of the error of the partition of stamps relating to founders, and in fact we have insufficient information to assess accurately how "wrong" these models are, or how importantly they are "wrong".

There is more solid grounds upon which the accuracy of the partitions of stamps relating to foundries can be assessed (Table 39). Again, for the identification of groups relating to foundries, correspondence analysis produces a clustering which is considerably superior to those produced by the other techniques considered in this study. Only 37.7% of the stamps in the shared near-neighbour cluster analysis fall into groups equivalent to those formed by the correspondence analysis, and only 42.1% of those in the single-link cluster analysis fall into such equivalent groups. In this case, these techniques are more *importantly* "wrong". In particular, it seems that chaining is more apparent in the single-link cluster analysis of stamps than for that of bells. The movement of stamps between foundries seems to confuse the picture. Once more, k-means cluster analysis has produced a solution in which only 20.9% of stamps fall in clusters equivalent to those produced by consideration of the correspondence analysis. This solution also has a high level of estimated overall error (55.6%).

One final observation should be made about the cluster solutions produced from the analysis of this data set. In all cases the groupings revealed by single-link cluster analysis and shared near-neighbour cluster analysis are very similar. For the clusters relating to founders, 74.8% of the bells partitioned by the shared near-neighbour analysis fall into clusters equivalent to those formed by the single-link cluster analysis, and 78.7% of the stamps partitioned by the single-link analysis fall into clusters equivalent to those formed by the shared near-neighbour analysis. For clusters relating to foundries the partitions of stamps are very similar, with 84.6% of stamps partitioned by the single-link analysis allocated to clusters equivalent to those formed by the shared near-neighbour approach. The partitions of bells relating to foundries are less similar, with 63.2% of the bells partitioned by the single-link cluster analysis falling into equivalent clusters in the shared near-neighbour solution. It is only in this final instance that the reliance of shared near-neighbour analysis on a number of "shared neighbours", rather than a single-link, mitigates the effect of chaining in the dendrogram. Otherwise the supposed advantages of this technique over single-link cluster analysis (see §3.6) do not seem to have had a marked influence on the results of this application.

5.3 Ordination

It has been surprisingly difficult to isolate the chronological sequences of bells and stamps from the incidence matrix used in this study. There is no doubt that the incidences of stamps on bells are chronologically significant, as these relate to physical moulds which were present in the foundry. A particular stamp could not have been in the hands of more than one founder at a time; and it is demonstrable, from their incidences on bells which can be assigned to particular craftsmen on the basis of the information outlined in Chapter 2, that stamps were used by successive founders.

Approximately one third of the maps produced during the correspondence analyses of bells showed evidence of the horseshoe effect (Fig 87), with bells falling in a parabola usually in the first and second dimensions. The identification of this shape was, however, entirely visual and could be a matter of considerable doubt. No smooth and continuous curves were identified, the best examples showing evidence of gaps in the spread of bells or concentrations of bells at the centroid (Figs 120 and 125). A number of other maps showed these features (egs Figs 92 and 96), with others showing outlying groups of bells away from the main parabola (eg Fig 92). This outlying groups often fall below the base of the parabola. In other cases, the definition of an arc was by no means clear and largely in the eye of the beholder (eg Fig 91).

Having identified maps showing evidence of the horseshoe effect, archaeological interpretations of the pattern in the data is required. Such patterns are most often regarded as revealing chronological sequence in the data, but in this application it is demonstrable that a more complex variety of causes underlie the mapped variation.

Of the 38 maps formed during the correspondence analysis of bells which showed evidence of the horseshoe effect, 12 occurred during the 'peeling' of cluster E. The bells along the parabolas apparent in these graphs did not fall in chronological sequences, but rather showed geographical progression between different foundries (in four cases; eg Fig 96) or lines of descent between founders in a single foundry (in the other eight cases; eg Fig 120).

Twelve of the clusters of bells produced by the correspondence analysis have sufficient documentary evidence for the validity of a chronological interpretation of the sequence to be made. Six of these clusters mapped parabolas of bells from which an ordering could be obtained. Of these series, three were entirely consistent with the available documentary evidence, and two needed approximately one fifth of the documented bells to be misplaced for an accurate chronological sequence to be obtained (Table 37).

Sequences of bells could be obtained for all of the clusters using 'seriation' by means of the first axis of the correspondence analysis (Scollar *et al* 1987; Ihm 1981). Five of these series are entirely consistent with the documentary evidence, with three misallocating around one fifth of bells, and three misallocating two fifths (Table 37). There does not seem to be a relationship between the estimated error of a series (as calculated from the independent information outlined in Chapter 2) and the 'compactness' of the seriation (as measured by the Spearman's Rank Correlation coefficient (ρ); Hertzog and Scollar 1988; Table 37). In the two cases where the estimated errors of the series produced by consideration of one or two axes of the analysis differ, the order derived from the parabola is marginally superior (Table 37).

It is apparent from this analysis that considerable caution should be exercised in the interpretation of a series derived from correspondence analysis as a chronological sequence, certainly in the absence of independent information which might validate such an interpretation. Of the maps considered here, more than half can be shown to have formed parabolas of bells which are not of chronological significance. A chronological "model" for this phenomenon is *importantly* "wrong". These maps actually show geographical trends between bells cast in different foundries, and the complex relationships between individual craftsmen within single workshops.

A similar complexity is displayed by the correspondence analysis of stamps, although our understanding of the variation in this analysis is limited by the small number of trademarks which can be allocated to particular founders. Again, maps formed during the 'peeling' of cluster E show clear evidence of geographical trends between bells cast in different foundries (eg Fig 160). The complex succession of foundry lines is also reflected in these maps (eg Fig 167).

Only three clusters in this analysis have more than three stamps which can be independently dated, and only one of these produces a map which shows the horseshoe effect (Fig 208). Generally, the dated stamps in the correspondence analyses do show accurate chronological sequences (Table 38). In the two cases where there is a simple linear succession of founders (the Heathcotes of Chesterfield, cluster 11b; and the Hille/Sturdy line in London, cluster 16d), this is identified accurately. Connections between foundry lines complicate the picture, both with the (undocumented) association between Thomas Bett of Leicester and the Heathcotes (Fig 204), and the links between workers in London (Fig 206). Again, in situations where an ordering is available along the arc of a parabola on a map, this ordering is marginally more accurate than that produced by 'seriation' using one axis of the correspondence analysis only (Table 38).

5.4 Something about bells

The principal aim of this study has been to apply various methods of classification and ordination commonly used by archaeologists to the incidence matrix of bells and stamps, and to compare the results with what is known independently about these data from documentary sources. Nonetheless, it would be incomplete without at least a brief indication of some of the ways in which the approaches discussed in this volume may be able to illuminate our understanding of the English medieval bellfounding industry.

This can be demonstrated by consideration of the partition forming 35 clusters produced by the correspondence analysis of bells (Fig 87). These clusters show good agreement with the documentary evidence outlined in Chapter 2, with an estimated overall error of only 8.1%. It should be noted, however, that an even more accurate partition could be identified using correspondence analysis if the documentary evidence was used to inform the partition of the dataset, rather than simply to validate the resultant clustering. For example, with the knowledge that stamp 3.0044 is a trademark belonging to Robert Clarke of Lincoln, the boundary of cluster 24 (Fig 148) would be drawn closer to the centroid. This would have the effect of amalgamating clusters 24a and 30a, both of which contain bells cast by Robert. Notwithstanding this caveat, more than 90% accuracy is probably as good as can be reasonably expected in most archaeological applications, and so the following is based on the correspondence analysis of bells as described in §4.2.

Bells cast by founders based in Bury St Edmunds during the medieval period appear in cluster 5, with the main foundry of Reignald and Thomas Chirche (see §2.2.4.5 and §2.4.4) being represented by cluster 5b (Fig 212). Bells cast by founders based in Norwich appear in clusters 6b-6d (Fig 213).[4] The main foundry of the Brasyer family falls in cluster 6d, cluster 6c includes a bell bearing the name of Austen Bracker (§2.1.11), and cluster 6b may belong to a founder named Richard Kerner.[5] The Brasyer and Chirche foundries were certainly based in Norwich and Bury St Edmunds respectively. It is unclear whether Austen and Kerner (and the unknown founder who cast the bells in cluster 5a) were actually based in these towns, or were based somewhere smaller in the same region, or were itinerant craftsmen.

Foundries based in London fall in cluster 11 (Fig 214). Cluster 11d relates to William Dawe/Founder and related craftsmen around 1400, cluster 11e to the Hille/Sturdy line, and cluster 11f to William Chamberlyn and his successors (see §4.2 and Fig 189). The bells at Chebsey, Staffordshire (3044-5), which form cluster 11c, are not certainly Londoners.[6] Cluster 11b represents the earlier fourteenth-century London craftsmen, and cluster 11a contains most of the bells by Thomas Lawrence (§2.2.1 and §2.2.3). By the later fourteenth century London founders were sending bells across the English lowlands.

Bells from the Reading/Wokingham foundry have a more restricted distribution (Fig 215). Cluster 10c contains bells by Roger Landen, and probably his immediate predecessors and successors, and clusters 10a and 10b contain the bells of William Hazelwood and John White/John Saunders respectively (see §4.2 and Fig 187). Moving further west, we come to Salisbury, the first major foundry whose bells cannot be identified in numbers on the basis of documentary or iconographic information. The main Salisbury foundry appears to be represented by cluster 14d (Fig 216). This group seems to be linked to Robert Norton's foundry in Exeter by crosses 1.0015 and 1.0203, which

[4] An allied group, forming cluster 6a, includes bells bearing the name of Thomas de Wald, who is documented in York in 1372 (see §2.1.6). The link to the Norwich foundry is via crown 4.0017, which appears with Thomas' cross (1.0188) at Bitchfield, Lincolnshire (1989), and with the Brasyer shield (3.0091) at Repton, Derbyshire (0454). It is possible that this connection actually relates to the reuse of both stamps by the sixteenth century Leicester foundry of the Newcombes, although this is at present unproven.
[5] One of the bells in this group is that at Canterbury (St Dunstan), Kent (1671). The churchwarden's accounts for this parish in 1500 record "Item payde to Rychard Kerner for new making of the same belle - iijs viijd" (Stahlschmidt 1887, 47).
[6] They bear sets of lettering which are unrecorded elsewhere and are linked to this group by the unquartered royal arms (3.0003). It is possible, therefore, that these arms are not from the same mould as the others in this group, but from a second independently manufactured mould.

appear to have migrated there.[7] The distributions of the other clusters of bells shown on Figure 216 do not extend to the east of Salisbury, and so, although they may be by founders who were based in that city, they may equally be by craftsmen working from one of the smaller towns in north Dorset (eg Sherborne or Shaftesbury). This is particularly true of clusters 4 and 13, which do not have strong links in the incidence matrix with cluster 14d.

Moving westwards again, the foundry at Exeter is represented by clusters 18a and 18b (Fig 217). Cluster 18a contains bells by Robert Norton, and cluster 18b includes bells bearing the initials 'it' (see §2.2.4.2). These groups are connected strongly to cluster 18c, which seems to contain bells which were cast by a related founder based in Gloucester (see above; §4.2 and Fig 140). The main foundry working in Bristol in the Middle Ages falls in clusters 19b-d (Fig 218). The related group, cluster 19a, which bears the initials of Roger Sempson of Aish Priors is confined to the Somerset/Devon border, and so Sempson may have worked as an itinerant craftsman in this region. Similarly, the bells in cluster 21b all lay south of Bristol in Somerset, and so it is possible that they too were cast by an unrelated craftsman working out of one of the smaller towns in this region.

Gloucester is the second major medieval foundry whose bells cannot be certainly identified from the documentary sources. In addition to cluster 18c, which is closely associated with the Norton line in Exeter, cluster 17 also seems to be centred on this town (Fig 219).[8] Bells from the Worcester foundry also cannot be tied to the documentary record. Clusters 31a, 23, 2, and B all appear to have distributions which centre on this town (Fig 220), although there is certainly some 'noise' in these attributions.[9]

Moving north, of the bells cast at Leicester during the medieval period, only those of Thomas Bett can be identified on the basis of iconography. Bells bearing Thomas' shield fall in cluster 21a, with the distributions of bells in clusters 8, 9a, and 12 also centring on the town (Fig 221). Some of those in cluster 8 bear the name of John of York, an otherwise undocumented founder.

[7] The two bells at Kingswear and West Teignmouth, Devon (0616 and 0725), which belong to cluster 14d and bear the 'it' shield (3.0030), seem to be part of this later use of these stamps.
[8] Given these close links, there must be some possibility that at least some of the bells allocated to cluster 18c in Devon are in fact by the Exeter workshop.
[9] For example, cluster 23 also contains a few bells by John Barber of Salisbury (§2.1.7), the Somerset founder "R" (§2.3.8), and Thomas Bett of Leicester (§2.2.4.1).

No bells cast in Nottingham can be identified using the documentary evidence outlined in Chapter 2. On the basis of the distribution of surviving examples, the bells in clusters 1, 7d, 7e, 24b, 27, and 30b seem to have been cast in this city (Fig 222). Some of the examples in cluster 1 bear the name of John de Colsale, an otherwise undocumented founder. He may have been itinerant, or based elsewhere in the region, as none of his bells are particularly close to Nottingham itself. Cluster 7e appears to belong to the founder who used trademark 3.0095, and cluster 24b (and less certainly, cluster 30b) to the founder who used trademark 3.0085. This latter founder seems to have been connected to Robert Clerke of Lincoln.

Bells by the Heathcote family of Chesterfield appear in cluster 9d (Fig 223). They had connections to the Leicester foundry (see above cluster 9a), probably through Thomas Bett, and also to workers in York. This is shown by the distribution of bells in cluster 9c (Fig 224), which joins a number of other groups that seem to comprise the well-documented York foundry. Clusters 7b and 7c have distributions which are centred rather further north than the other bells in cluster 7, and seem to show links between craftsmen working in York and others working in Nottingham (clusters 7d and 7e; see above) and North Lincolnshire (cluster 7a; see below). Some of the bells in cluster 7b bear the name of John Potter, and some of those in cluster 6a bear the name of Thomas de Wald (see §2.1.6). This may demonstrate a connection with the Norwich foundry (see above fn 4). Finally, bells bearing the names of John de Kirkham and John de Copgrave occurring in cluster A (see §2.1.6 and see §2.1.11) and the undocumented bells in cluster B, are also distributed in the northern counties (Fig 224).

Very few bells belonging to the well-documented foundry at King's Lynn are isolated by this analysis (Fig 225). Cluster 29 includes bells bearing the name of Thomas Derby (see §2.1.3), but also that bearing the name of William Rufford of Toddington, Bedfordshire (§2.1.7). It seems that the Lynn foundry, which was most active in the fourteenth-century before facing competition from the Brasyers in Norwich, has left relatively few extant bells.

Finally, a few outlying clusters, which seem to relate to itinerant founders or men working from minor centres of bellfounding, must be mentioned. Robert Clerke of Lincoln (see §2.2.4.5), who seems to have had some connection with the Nottingham foundry, cast the bells in clusters 24a and 30a (Fig 226). Other, undocumented, founders

were also working in Lincolnshire, represented by clusters 7a and C (Fig 226). Elsewhere in the Midlands, clusters D, 15, 20, 25, 26, and 28 also seem to belong to undocumented founders with limited connections to the larger foundries (Fig 227). Lastly, clusters 3 and 22 contain bells by John Tonne and Thomas Harrys (Fig 228; see §2.1.8 and §2.3.6), both of whom had London connections although do not appear to have been part of the main foundries established in the capital.

Figure 229 shows the overall distribution map of recorded medieval bells which can be assigned to a particular foundry on the basis of the correspondence analysis of bells (see §4.2) and the documentary evidence outlined in Chapter 2. Comparison of this map with that showing the documented bells alone (Fig 36), demonstrates that bells by all the principal medieval foundries known from documentary evidence can now be identified. In particular, the foundries based in Gloucester and Worcester account for many of the bells in the Welsh Marches, and the Salisbury foundry accounts for many of those in Dorset. In the Midlands, clusters of bells probably cast by foundries based in Leicester and Nottingham have also been identified, and some progress has also been made in the isolation of bells probably cast by craftsmen based in York.

It is true, however, that a disproportionately small number of bells from northern counties can be assigned to foundries (compare Figs 1 and 229). It is unclear whether this is because of the relatively poor recording of these northern bells, most of which only appear in lists, without illustration, or whether the logistics of transporting bells in the hilly northern counties meant that the industry had to be organised differently in this region. There do not appear to be substantial lines of related founders, such as exist in London and some of the other provincial foundries, in York. Rather the analysis seems to reveal a number of relatively independent workmen who cast bells. This may suggest that a model of itinerant founders, casting in churchyards, familiar from the documentary records of the sixteenth and seventeenth centuries is more appropriate for the northern counties in this period.

Figures 212-29 demonstrate convincingly that the London foundries were different. They achieved an almost national distribution, and managed to compete with all the provincial foundries within their immediate hinterlands. Once the Brasyer foundry became established in Norwich, the Londoners were excluded from Norfolk, and they never obtained more than a foothold in the Severn valley. Otherwise, they succeeded in

penetrating most markets – forming the principal competition to the founders based in York north of the Humber, and to the Nottingham foundry in the Lincolnshire Marsh. Although excluded by the Brasyers from Norfolk, they competed fiercely with the Bury St Edmunds foundry further south in East Anglia, and with the Reading/Wokingham and Salisbury businesses to the west. In the South-West, they never managed to provide more than sporadic opposition to the local foundries, although they did maintain a dominant position in the Cornish market.

Provincial founders rarely provided bells for churches more than 50 miles from their base, although Bristol and Gloucester did supply bells along a 100 mile strip bordering the Bristol channel and Severn respectively. Simple inspection of Figure 229 suggests that these provincial foundries fall into two groups, those with distributions of bells covering more than *c* 2000 square miles (Bristol, Exeter, Gloucester, Nottingham, Norwich, and Reading/Wokingham), and those with hinterlands between *c* 1000 and 2000 square miles (Bury St Edmunds, Chesterfield, Leicester, Salisbury, and Worcester).[10] York is again different, with a much larger, but less dense, spread of bells.

This brief discussion demonstrates that, by using correspondence analysis along with the documentary evidence, considerable progress has been made in tracing the provenance of the recorded medieval bells in England. Chapters 3 and 4 demonstrate that similar, but more limited, progress has been made in determining the founders who cast those bells. In contrast, in this study, little progress has been made in tracing the links between founders that might enable a chronological sequence of their bells to be constructed.

5.5 Conclusions

A range of numerical methods have been applied in this study to the incidence matrix of stamps on the recorded medieval bells of England. The results of these analyses have been compared with an independent standard, provided by the documentary and iconographic evidence for the industry supplied by documentary sources and inscriptions on the bells themselves.

[10]Bury St Edmunds may, more properly, fall into the former group. Although constrained on all sides by fierce competition from Norwich and London, the density of bells from this foundry is very high.

These methods have been successful in identifying groups of bells which were cast by particular foundries, and have had some success in isolated groups of bells by particular craftsmen. "All models are wrong", but only k-means cluster analysis is consistently *importantly* "wrong" for this application. This seems to be because the simple matching coefficient is not appropriate for these data. Some difficulties have been experienced with "chaining" in the identification of clusters relating to foundries using single-link cluster analysis, although in general fewer problems have been encountered in the use of this method than expected. Shared near-neighbour cluster analysis has also provided results which are in good agreement with the documentary evidence, but has little advantages over single-link cluster analysis in practice for this application. In general, these methods have allocated between two thirds and three quarters of bells to clusters which are consistent with the independent evidence (Table 39).

These methods have had less success in revealing the chronological sequences of bells and stamps. Correspondence analysis has in fact had more success in defining geographically separated groups of bells, than in determining chronological sequences. Even for maps which show clear evidence of the horseshoe effect, the resultant series is as likely to relate to geographical variation in the data or to the complex relations within foundry lines, as to relative chronology. Some accurate chronological sequences have been defined, but "time is not the only dimension" (Kruskal 1971).

5.6 Further work

This study has only dealt with a limited range of the mathematical approaches which might be applied to this dataset. Other techniques could be applied, and it is hoped that the availability of the incidence matrix (Appendix 3) and independent standard against which the results may be validated (Chapter 2) will enable this to occur. This data may also prove useful in the development of new approaches. In particular, the explicit definition of the "prior information" relating to the incidence matrix in Chapter 2 may enable the development of Bayesian approaches to classification and ordination, which have so far been rarely applied in archaeology.

There are many more life-times of work remaining in the study of medieval bells. Perhaps a quarter of the marks on the bells are included in the incidence matrix used in this study.

Recording the remaining data will be the work of many hands over many years. In addition to visiting the existing bells, progress could be made by examination of the collections of bell-rubbings made by many of the Victorian pioneers.

Much more information about the medieval bellfounding industry is also waiting to be discovered in historical archives. Comparatively little systematic research has been done by campanists in these archives since the First World War. Such study will not only expand and refine the standard discussed in Chapter 2, but will raise further questions about the industry.

Once the basic classification and dating of the bells has been undertaken, there are many ways in which further analysis of the dataset will be able to illuminate our understanding of medieval industry. In particular, the surviving bells form a sample from an approximately known population (because of the Edwardian Inventories). This should enable spatial analysis to tackle questions about the transportation of (an expensive!) bulk commodity, and about competition between different centres in a way that is rarely matched.

Firstly, however, the questions of classification and chronology have to be explored. Without this, further and more sophisticated analysis is fallacious. It is hoped that this study is a step in the construction of a firm foundation for further research.

BIBLIOGRAPHY

Adams, W Y, 1988 Archaeological classification: theory versus practice, *Antiquity*, **62**, 40-56

Aitken, M J, Tite, M S, Reid, J, 1964 Thermoluminescent Dating of Ancient Ceramics, *Nature*, **202**, 1032-3

Aldenderfer, M S, 1982 Methods of cluster validation for archaeology, *World Archaeology*, **14**, 61-72

Aldenderfer, M S, 1987 Assessing the impact of quantitative thinking on archaeological research: historical and evolutionary insights, in *Quantitative Research in Archaeology* (ed M S Aldenderfer), 9-29, Beverly Hills (Sage)

Aldenderfer, M S, and Blashfield, R K, 1978 Cluster analysis and archaeological classification, *American Antiquity*, **43**, 502-5

Aldenderfer, M S, and Blashfield, R K, 1984 *Cluster analysis*, Quantitative Applications in the Social Sciences, **44**, Beverly Hills (Sage)

Aldridge, Rev G Dey, 1914 The Church Bells of Somerset: their history, use, and founders, *Proc Somerset Archaeol Natur Hist Soc*, **60**, 59-87

Anderberg, M, 1973 *Cluster analysis for applications*, New York (Academic Press)

Anon, 1856 Examples of medieval seals, *Archaeol J*, **13**, 62-76

Anon (ed), 1891 *Calendar of the Patent Rolls preserved in the Public Records Office: Edward III, AD 1327-1330*, London

Anon, 1888 The late Thomas North FSA, *Trans Leics Archaeol Soc*, **6**, 91-3

Anon, 1893 Notes of the Month, *The Antiquary*, **28**, 2-4

Anon (ed), 1895 *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, AD 1377-1381*, London

Anon, 1897a Register of the Freemen of the City of York from the City Records: Volume 1, 1272-1558, *Surtees Soc*, **96**

Anon (ed), 1897b *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, AD 1381-1385*, London

Anon (ed), 1897c *Calendar of the Patent Rolls preserved in the Public Records Office: Edward IV, AD 1461-1467*, London

Anon (ed), 1900a *Calendar of the Patent Rolls preserved in the Public Records Office: Edward IV & Henry VI, AD 1467-1477*, London

Anon (ed), 1900b *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, AD 1385-1389*, London

Anon (ed), 1902a *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, vol IV, AD 1388-1392*, London

Anon (ed), 1902b *Calendar of the Patent Rolls preserved in the Public Records Office: Edward III, AD 1343-1345*, London

Anon (ed), 1902c *A Descriptive Catalogue of Ancient Deeds in the Public Records Office: volume IV*, London

Anon (ed), 1905a *Calendar of the Patent Rolls preserved in the Public Records Office: Henry IV, vol II, AD 1401-1405*, London

Anon (ed), 1905b *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, vol V, AD 1391-1396*, London

Anon (ed), 1907a *Calendar of the Patent Rolls preserved in the Public Records Office: Henry IV, vol III, AD 1405-1408*, London

Anon (ed), 1907b *Calendar of the Patent Rolls preserved in the Public Records Office: Henry VI, vol II, AD 1429-1436*, London

Anon (ed), 1908 *Calendar of the Close Rolls preserved in the Public Records Office: Edward I, vol V, AD 1302-1307*, London

Anon (ed), 1909a *Calendar of the Patent Rolls preserved in the Public Records Office: Henry VI, 1446-1452*, London

Anon (ed), 1909b *Calendar of the Patent Rolls preserved in the Public Records Office: Henry IV, vol IV, AD 1408-1413*, London

Anon (ed), 1909c *Calendar of the Patent Rolls preserved in the Public Records Office: Richard II, vol VI, AD 1396-1399*, London

Anon (ed), 1910a Suffolk in 1524, being the Return for a Subsidy granted in 1523, *Suffolk Green Books*, **10**, Woodbridge

Anon (ed), 1910b *Calendar of the Patent Rolls preserved in the Public Records Office: Henry VI, AD 1452-1461*, London

Anon (ed), 1910c *Calendar of the Patent Rolls preserved in the Public Records Office: Henry V, vol I AD 1413-1416*, London

Anon (ed), 1912 *Calendar of the Patent Rolls preserved in the Public Records Office: Edward III, vol XIII, AD 1364-1367*, London

Anon (ed), 1916b *Calendar of the Patent Rolls preserved in the Public Records Office: Henry VII, vol II, AD 1494-1509*, London

Anon (ed), 1922b *Calendar of the Close Rolls preserved in the Public Records Office: Richard II, vol IV, AD 1389-1392*, London

Anon (ed), 1929 *Calendar of the Close Rolls preserved in the Public Records Office: Henry IV, vol II, AD 1402-1405*, London

Anon (ed), 1933 *Calendar of the Close Rolls preserved in the Public Records Office: Henry VI, vol II, AD 1429-1436*, London

Anon (ed), 1941 *Calendar of the Close Rolls preserved in the Public Records Office: Henry VI, vol V, AD 1447-1454*, London

Anon (ed), 1953 *Calendar of the Close Rolls preserved in the Public Records Office: Edward IV, vol II, AD 1468-1476*, London

Badham, S, and Blatchly, J, 1988 The Bellfounder's Indent at Bury St Edmunds, *Proc Suffolk Inst Archaeol*, **36**, 288-97

Barclay, K, Biddle, M, and Orton, C, 1990 The chronological and spatial distribution of the objects, in *Object and Economy in Medieval Winchester (volume I)* (ed M Biddle), 42-73, Oxford (Clarendon Press)

Barceló, J A, 1996 Heuristic classification and fuzzy sets: new tools for archaeological typologies, *Analecta Praehistorica Leidensia*, **28**, 155-64

Barceló, J A, and Faura, J M, 1999 Time series and neural networks in archaeological seriation: an example on early pottery from the Near East, in *Archaeology in the age of the internet: CAA97* (eds L Dingwall, S Exon, V Gaffney, S Laflin, and M van Leusen), BAR Int Ser, **750**, 91-102, Oxford (Archaeopress)

Barron, C M, 1994 Johanna Hill (d. 1441) and Johanna Sturdy (d. c. 1460), Bell-Founders, in *Medieval London Widows, 1300-1500* (eds C M Barron and A F Sutton), 99-111, London

Bateson, M, 1901 *Records of the Borough of Leicester: Volume II*, London

Bateson, M, 1905 *Records of the Borough of Leicester: Volume III*, Leicester

Batt, C M, 1997 The British archaeomagnetic calibration curve: an objective treatment, *Archaeometry*, **39**, 153-68

Baxter, M, 1992 Archaeological uses of the biplot—a neglected technique?, in *Computer Applications and Quantitative Methods in Archaeology 1991* (eds G Lock and J Moffett), BAR Int Ser, **S577**, 141-9, Oxford (Tempus Reparatum)

Baxter, M, 1994 *Exploratory Multivariate Analysis in Archaeology*, Edinburgh (University Press)

Baxter, M, 2003 *Statistics in Archaeology*, London (Arnold)

Bayliss, A, 1987 *Pre-Reformation Bells and Bellfounders from the City of London*, undergraduate Dissertation, University College London

Bayliss, A, and Orton, C, 1988 Seriation with parallel series—an historical example, in *Computer and Quantitative Methods in Archaeology 1988* (ed S P Q Rahtz), BAR Int Ser, **446**, 161-76

Bayliss, A, Bronk Ramsey, C, and McCormac, F G, 1997 Dating Stonehenge, in *Science and Stonehenge* (eds B Cunliffe and C Renfrew), 39-59, London (Proceedings of the British Academy **92**)

Bayne, C K, Beauchamp, J J, Begovich, C L, and Kane, V E, 1980 Monte Carlo comparisons of selected clustering procedures, *Pattern Recognition*, **12**, 51-62

Bell, R D, Beresford, M W, and others 1987 *Wharram: a Study of Settlement on the Yorkshire Wolds, volume III, Wharram Percy, the church of St Martin*, Soc Med Archaeol Monogr Ser, **11**

Benson, G, 1898 York Bellfounders, in *Annual Report of the Council of the Yorkshire Philosophical Soc for MDCCCXCVIII*, 17-34

Benson, G, 1904 York Bellfounders, *Associated Architect Soc Reports and Papers*, **27 (part 2)**, 623-49

Bestall, J M, and Fowkes, D V, 1977 Chesterfield wills and inventories 1521-1603, *Derbyshire Record Soc*, **1**

Bickley, F B, 1900 *The Little Red Book of Bristol*, Bristol

Biddle, M, 1990 *Object and Economy in Medieval Winchester*, Oxford

Bølviken, E, Helskog, E, Helskog, K, Holme-Olsen, I M, Solheim, L, and Bertelsen, R, 1982 Correspondence analysis: an alternative to principal components, *World Archaeology*, **14**, 41-60

Box, G E P, 1976 Science and Statistics, *J American Statistical Assoc*, **71**, 791-9

Box, G E P, 1979 Robustness in scientific model building, in *Robustness in Statistics* (eds R L Launer and G N Wilkinson), 201-36, New York (Academic Press)

Blair, R, 1887 Heigington and its Church, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **2**, 308-9

Blair, R, 1889a Miscellanea: Local Bell Inscriptions - Co. Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 5-6

Blair, R, 1889b Rubbings of the Inscriptions on the Bells, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 39-40

Blair, R, 1889c Alnwick - the Parish Church of St Michael and St Mary, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 73-9

Blair, R, 1889d Eglingham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 100-2

Blair, R, 1889e Morpeth, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 103-22

Blair, R, 1889f Bywell, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 123-30

Blair, R, 1889g Rubbings of the Inscriptions on the two Bells in the Turret of Bishop Middleham Church, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 133

Blair, E. 1889h Rubbings made by himself of Bell Inscriptions, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 133-4

Blair, R. 1889i Warkworth, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 145-52

Blair, R. 1889j Ovingham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 161-8

Blair, R. 1889k Exhibited - Rubbings of Inscriptions, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 188-97

Blair, R. 1889l Monk Heselden, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 202-4

Blair, R. 1889m Bell Inscriptions, Co. Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 246-8

Blair, R. 1889n Miscellanea: Notes on Church Plate and Bells in the County of Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 285-96

Blair, R. 1889o Miscellanea: Church Bells and Plate, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 309

Blair, R. 1889p Gainford, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 373-8

Blair, R. 1889q Miscellanea: County of Northumberland - Notes of Church Plate, Bells, &c., *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 392

Blair, R. 1889r Miscellanea: Notes on Church Plate and Bells in the County of Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 412-14

Blair, R. 1889s Miscellanea: Notes of Communion Plate &c., in the County of Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 424-6

Blair, R. 1889t Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **3**, 427-32

Blair, R. 1891a Exhibited - Full-size Drawing of the Communion Cups, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 12-27

Blair, R. 1891b Exhibited - Rubbings of the Inscriptions on the Bells, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 32-3

Blair, R. 1891c Haughton-le-Skerne, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 53-6

Blair, R. 1891d All Saints Pavement, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 62

Blair, R. 1891e Beverley Minster, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 87-92

Blair, R. 1891f Exhibited - Rubbings of Bell Inscriptions, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 119-20

Blair, R. 1891g Notes of Communion Plate and Bells in the County of Durham, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **4**, 121-36

Blair, R. 1891h Miscellanea: Notes of Communion Plate and Bells in the County of Northumberland. *Proc Soc Antiq Newcastle upon Tyne*, 2 ser. **4**. 158-60

Blair, R. 1891i Miscellanea: Notes of Communion Plate and Bells in Durham and Northumberland. *Proc Soc Antiq Newcastle upon Tyne*, 2 ser. **4**. 165-8

Blair, R. 1891j Miscellanea: Notes of Communion Plate and Bells, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser. **4**. 180-92

Blair, R. 1893a Notes of Communion Plate, &c., in the Diocese of Northumberland, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **5**, 29-31

Blair, R. 1893b Exhibited - Rubbings of the Inscriptions on the four Bells in the Tower of Spofforth, Yorkshire, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **5**, 184-5

Blair, R. 1893c Exhibited - Rubbings of Inscriptions on Bells, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **5**, 204-6

Blair, R. 1893d Miscellanea: Hartburn Church, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **5**, 234

Blair, R. 1893e Exhibited - a Number of Rubbings, *Proc Soc Antiq Newcastle upon Tyne*, 2 ser, **5**, 246-7

Blasius, J, and Greenacre, M (eds), 1998 *Visualisation of Categorical Data*, San Diego (Academic Press)

Blaylock, S R, 1996 Bell and Cauldron Founding in Exeter, *J Historical Metallurgy Soc*, **30**, 72-82

Bliss, M, and Sharpe, F, 1986 *Church Bells of Gloucestershire*, Gloucester

Blomefield, Rev F, 1805 *An essay towards a topographical history of the county of Norfolk, volume 1*, London

Bock, H H (ed) 1988 *Classification and related methods of data analysis: Proceedings of the First Conference of the International Federation of Classification Societies (IFCS) Technical University of Aachen, F R G, 29 June –1 July, 1987*, Amsterdam (North Holland)

Boughey, Rev A H F, 1919 Inscriptions upon Mediaeval Bells, *Archaeol J*, 2 ser, **76**, 74-83

Boyd, P, 1928 *Index to London Lay Subsidy for 1412*, typescript Guildhall Library

Brainerd, G W, 1951 The place of chronological ordering in archaeological analysis, *American Antiquity*, **16**, 301-13

Brewer, J S, 1876 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol IV (part III)*, London

Brodie, R H, 1920 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol I*, 2nd edn, London

Bronk Ramsey, C. 1995 Radiocarbon calibration and the analysis of stratigraphy: the OxCal program, *Radiocarbon*, **37**, 425-30

Brooke, C J, 1983 A survey of Nottinghamshire church bellframes: an interim report, *Trans Thoroton Soc Nottinghamshire*, **87**, 46-53

Buck, C E, Kenworthy, J B, Litton, C D, and Smith, A F M, 1991 Combining archaeological and radiocarbon information: a Bayesian approach to calibration, *Antiquity*, **65**, 808-21

Buck, C E, 1993 The provenancing of archaeological ceramics: a Bayesian approach, in *Computing the Past: CAA92 Computer Applications and Quantitative Methods in Archaeology* (eds J Andresen, T Madsen, and I Scollar), 293-301, Aarhus (Aarhus University Press)

Buck, C E, Cavanagh, W G, and Litton, C D, 1996 *Bayesian Approach to Interpreting Archaeological Data*, Chichester (Wiley)

Buck, C E, Christen, J A, and James, G N, 1999 BCal: an on-line Bayesian radiocarbon calibration tool, *Internet Archaeology*, **7**, http://intarch.ac.uk/journal/issue7/buck/

Buck, C E, and Litton, C D, 1991 A Bayes approach to some archaeological problems, in *Computer Applications and Quantitative Methods in Archaeology* (eds K Lockyear and S P Q Rahtz), BAR Int Ser, **565**, 93-9

Buck, C E, and Sahu, S K, 2000 Bayesian models for relative archaeological chronology building, *Applied Statistics*, **49**, 423–40

Burgess, C, 1995 *The Pre-Reformation Records of All Saints', Bristol: Part 1*, Oxford and Northampton

Burn, J S, 1861 *A History of Henley-on-Thames*, London

Campbell, M, 1998 Medieval Metalworking and Bury St Edmunds, in *Bury St Edmunds: Medieval Art, Architecture, Archaeology, and Economy* (ed A Gransden), *Trans Brit Archaeol Assoc Conference*, **20**, 69-80

Candler, C, 1896 *Notes on the Parish of Redenhall with Harleston in the County of Norfolk*, London

Cannon, A C, 1979 *Church Bells of Cornwall*, Truro

Cattermole, P, 1985 The Church Towers, Bells, and Bell Frames in the Hundreds of Clavering, Depwade, Diss, Earsham, Henstead and Loddon, in South-east Norfolk, unpubl PhD thesis, Univ London

Cattermole, P, 1990 *Church Bells and Bellringing: A Norfolk Profile*, Woodbridge

Cattermole, P, 1991 *The Church Bells of Norfolk: Part 1, the Hundred of Clavering*, Aylsham

Cattermole, P. 1992 *The Church Bells of Norfolk: Part 2, the Hundred of Lodden*, Aylsham

Cattermole, P. 1996a *The Church Bells of Norfolk: Part 3, the Hundred of Diss*, Aylesham

Cattermole, P. 1996b *The Church Bells of Norfolk: Part 4, the Hundred of Earsham*, Aylesham

Cattermole, P. 2000 *The Church Bells of Norfolk: Part 5, the Hundred of Depwade*, Aylesham

Cattermole, P. and Cotton, S. 1983 Mediaeval parish church building in Norfolk, *Norfolk Archaeol*, **38**, 235-79

Cheetham, F H, 1914 The Church Bells of Lancashire: Part 1, *Trans Lancashire Cheshire Antiq Soc*, **32**, 1-163

Cheetham, F H, 1915 The Church Bells of Lancashire: Part 2, *Trans Lancashire Cheshire Antiq Soc*, **33**, 1-116

Cheetham, F H, 1916 The Church Bells of Lancashire: Part 3, *Trans Lancashire Cheshire Antiq Soc*, **34**, 1-76

Cheetham, F H, 1919 The Church Bells of Lancashire: Part 4, *Trans Lancashire Cheshire Antiq Soc*, **37**, 35-66

Cheetham, F H, 1921 The Church Bells of Lancashire: Part 5(i), *Trans Lancashire Cheshire Antiq Soc*, **39**, 125-81

Cheetham, F H, 1922 The Church Bells of Lancashire: Part 5(ii), *Trans Lancashire Cheshire Antiq Soc*, **40**, 76-153

Cheetham, F H, 1928 The Church Bells of Lancashire: Part 6, *Trans Lancashire Cheshire Antiq Soc*, **45**, 89-128

Chew, H M (ed), 1965 London Possessory Assizes: a Calendar, *London Record Soc*, **1**

Chew, H M, and Kellaway, W (eds), 1973 London Assize of Nuisance 1301-1431, *London Record Soc*, **10**

Chitty, H, 1920 The Winchester College bells and belfries, *Proc Hants Field Club*, **9**, 37-80

Christen, J A, and Litton, C D, 1995 A Bayesian approach to wiggle-matching, *J Archaeol Sci*, **22**, 719-25

Christen, J A, Clymo, R S, and Litton, C D, 1995 A Bayesian approach to the use of ^{14}C dates in the estimation of the age of peat, *Radiocarbon*, **37**, 431-42

Christenson, A, and Read, D, 1977 Numerical taxonomy, r-mode factor analysis, and archaeological classification, *American Antiquity*, **42**, 163-79

Clarence, L B, 1898 Church Bells of Dorset, *Dorset Natur Hist Antiq Fld Club Proc*, **19**, 25-42

Clarke, J W, 1948 Cheshire Bells: a Detailed Survey and History of the Bells of the County: Part 1, *Trans Lancashire Cheshire Antiq Soc*, **60**, 86-116

Clarke, J W, 1950 Cheshire Bells: Part 3, *Trans Lancashire Cheshire Antiq Soc*, **62**, 29-53

Clarke, J W, 1952 Cheshire Bells: Part 4, *Trans Lancashire Cheshire Antiq Soc*, **63**, 27-51

Clarke, J W, 1955 Cheshire Bells: Part 5, *Trans Lancashire Cheshire Antiq Soc*, **65**, 48-69

Clausen, S-E, 1998 *Applied Correspondence Analysis: an introduction*, London (Sage)

Clouston, R W M, and Pipe, G J W, 1980 *Bells and Bellringing in Suffolk*, Ipswich

Cockey, Rev H A, 1911 The Church Bells of Gloucestershire, in Memorials of Gloucestershire (ed Rev P H Ditchfield), London

Cocks, A H, 1897 *The Church Bells of Buckinghamshire: their inscriptions, founders, uses and traditions*, London

Colchester, Rev W E, 1920 *Hampshire Church Bells: their founders and inscriptions*, Winchester

Collins, F (ed), 1889 Index of Wills in the York Registry, 1389 to 1514, *Yorkshire Archaeol Topographical Ass Record Ser*, **6**

Collins, F (ed), 1891 Index of wills in the York Registry, AD 1514 to 1553, *Yorkshire Archaeol and Topographical Ass Record Ser*, **11**

Cool, H E M, and Baxter, M J, 1995 Finds from the fortress: artefacts, buildings and correspondence analysis, in *Computer Applications and Quantitative Methods in Archaeology 1993* (eds J Wilcock and K Lockyear), BAR Int Ser, **598**, 177-82

Cool, H E M, and Baxter, M J, 1999 Peeling the onion: an approach to comparing vessel glass assemblages, *J of Roman Archaeol*, **12**, 72-100

Cowgill, G L, 1990 Why Pearson's *r* is not a good similarity coefficient for comparing collections, *American Antiquity*, **55**, 512-21

Cozens-Hardy, B, and Kent, E A, 1938 *The mayors of Norwich 1405-1835*, Norwich and London

Cresswell, B F, 1916 The Edwardian Inventories for the City and County of Exeter, *Alcuin Club Collect*, **20**

Dasent, J R (ed), 1892 *Acts of the Privy Council of England: new series, vol IV, AD 1552-1554*, London

Daniel, G, 1975 *150 years of archaeology*, 2nd edn, London (Duckworth)

Dawson, G A, 1994 *The Church Bells of Nottinghamshire: Part One*, Loughborough

Dawson, G A, 1995a *The Church Bells of Nottinghamshire: Part Two*, Loughborough

Dawson, G A, 1995b *The Church Bells of Nottinghamshire: Part Three*, Loughborough

Dawson, G A, 1998 *The Church Bells of the Diocese of Sheffield in the County of Yorkshire*, Loughborough

Deedes, Rev C, and Walters, H B, 1909 *The Church Bells of Essex: their founders, inscriptions, traditions and uses*, Aberdeen

Dellaportas, P, 1998 Bayesian classification of Neolithic tools, *Applied Statistics*, **47**, 279-97

Devon, F, 1837 *Issues of the Exchequer: being a collection of payments made out of his Majesty's revenue from King Henry III to King Henry VI inclusive*, London

Diday, E, Lechevallier, Y, Schader, M, Bertrand, P, and Burtschy, B, 1994 *New Approaches in Classification and Data Analysis*, Berlin (Springer Verlag)

Ditchfield, P H, and Page, W (eds), 1906 *The Victoria County History of Berkshire*, **1**, London

Djindjian, F, 1985 Seriation and toposeriation by correspondence analysis, in *To pattern the past* (eds A Voorrips and S H Loving), *PACT*, **11**, 119-35

Djindjian, F, 1989 Fifteen years of contributions of the French school of data analysis, in *Computer Applications and Quantitative Methods in Archaeology 1989* (ed S P Q Rahtz and J Richards), BAR Int Ser, **548**, 193-204

Dobson, R B, 1967 The foundation of perpetual chantries by the citizens of medieval York, in *Studies in Church History IV* (ed G J Cuming), Leiden

Dodds, G, 1994 *The Church Bells of Hertfordshire*, Welwyn Garden City

Doran, J E, and Hodson, F R, 1975 *Mathematics and Computers in Archaeology*, Edinburgh (Edinburgh University Press)

Douglas, A E, 1935 Dating Pueblo Bonito and other ruins of the Southwest, *Contributed technical papers, Pueblo Bonito Series No 1*, Washington DC (National Geographic Soc)

Draper, F W M, 1951 The Bells of Middlesex, *Trans London Middlesex Archaeol Soc*, new ser, **10**, 310-14

Dunkin, E W H, 1878 *The Church Bells of Cornwall: their archaeology and present condition*, London and Derby

Eeles, F C, 1905 The Edwardian Inventories for Bedfordshire, *Alcuin Club Collect*, **6**

Eisel, J C, 1977 *The Bells of Hereford Cathedral*, Hereford

Ekwall, E. 1951 Two Early London Subsidy Rolls. Lund (Gleerup)

Ellacombe, Rev H T. 1867 The Church Bells in the Towers of all the Parish Churches in Devonshire. *Trans Exeter Diocesan Architectural Soc*, 2 ser, **1**, 221-427

Ellacombe, Rev H T. 1872 *The Church Bells of Devon, with a list of those in Cornwall to which is added a supplement on various matters relating to 'Bells of the Church'*. Exeter

Ellacombe, Rev H T. 1875 *The Church Bells of Somerset: to which is added an olla podrida of bell matters of general interest*. Exeter

Ellacombe, Rev H T. 1881 *The Church Bells of Gloucestershire, to which is added a budget of bell matters of general interest*. Exeter

Elphick, G P. 1945 Sussex Bell Frames. *Sussex Archaeol Collect*, **84**, 33-59

Elphick, G P. 1960 The Oldest Wiltshire Bells. *Wiltshire Archaeol Natur Hist Mag*, **57**, 404-5

Elphick, G P. 1970 *Sussex Bells and Belfries*. Chichester (Phillimore)

Elphick, G P. 1988 *The craft of the bellfounder*. Chichester (Phillimore)

Everitt, B S. 1980 *Cluster analysis*. 1 edn. New York (Halsted)

Everitt, B. S. Landau, S. and Leese, M. 2001 *Cluster Analysis*. 4 edn. London (Arnold)

Fair, M C. 1949 The Pre-Reformation Bells of West Cumberland. *Trans Cumberland Westmorland Antiq Archaeol Soc*, new ser, **48**, 108-13

Fair, M C. 1951 A fifteenth-century Bell at Lamplugh. *Trans Cumberland Westmorland Antiq Archaeol Soc*, new ser, **50**, 209-10

Farrow, M A. 1945 *Index to wills proved in the Consistory Court of Norwich, and now preserved in the District Probate Registry at Norwich, 1370-1550, and wills among the Norwich enrolled deeds, 1286 – 1508*. British Record Soc, **69**

Finlayson, R. 2004 *Medieval Metalworking and Urban Life at St Andrewgate, York*. The Archaeology of York, **10/7**

Fowler, Rev J T. 1865 On Some Church Bells in the City and Neighbourhood of Durham, at Newcastle-on-Tyne, &c. *The Gentleman's Mag*, **219**, 267-80

Fowler, Rev J T. 1869 On a bell inscription at Rylstone, Yorkshire. *The Reliquary*, **10**, 52-4

Fry, A E (ed). 1897 *A Calendar of Wills pro British Record Society*, **17**

Furnivall, F J (ed) 1882 *The Fifty Earliest English Wills in the Court of Probate, London: AD 1387-1439 with a Priest's will of 1454*. London

Gairdner, J. 1880 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol V*. London

Gairdner, J. 1882 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol VI*. London

Gairdner, J. 1888 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol XI*. London

Gairdner, J. 1893 *Letters and Papers Foreign and Domestic of the Reign of Henry VIII, vol XIII (part II)*. London

Gairdner, J. 1896 *The Paston Letters, 1422-1509 AD*. 3 vols. London

Garbett, A E. 1953 Church Bells of Staffordshire. *The Old Stafford Soc Trans 1952-3*, 6-21

García Sanjuán, L. and Rodríguez López, J. 1996 Predicting the ritual? A suggested solution in archaeological forecasting through qualitative response models. *Analecta Praehistorica Leidensia*, **28**, 203-16

Gaythorpe, H. 1902 Church Bells in the Archdeaconry of Furness: Colton, Kirkby Ireleth, Broughton, Woodland and Seathwaite. *Trans Cumberland Westmorland Antiq Archaeol Soc*, new ser. **2**, 282-306

van de Geer, J P. 1993 *Multivariate analysis of categorical data: theory*, Advanced Quantitative Techniques in the Social Sciences, **2**. London (Sage)

Gelfand, A E, and Smith, A F M. 1990 Sampling based approaches to calculating marginal densities. *J American Statistical Assoc*, **85**, 398-409

Glasscock, J L. 1882 *The Records of St Michael's Parish Church, Bishop's Stortford*, London

Goodwyn, Rev Canon. 1898 An Old Churchwardens' Account Book of Rotherfield. *Sussex Archaeol Coll*, **61**, 25-48

Goslar, T, and Madry, M. 1998 Using the Bayesian method to study the precision of dating by wiggle-matching. *Radiocarbon*, **40**, 551-60

Gottfried, R S, 1982 *Bury St Edmunds and the Urban Crisis: 1290-1539*, Princeton

Gower, J C, 1971 A general coefficient of similarity and some of its properties. *Biometrics*, **27**, 857-72

Grace, M. 1937 Records of the Gild of St George in Norwich, 1389-1547: a transcript with an introduction. *Norfolk Record Soc*, **9**

Graham, I, Galloway, P, and Scollar, I. 1976 Models in computer seriation. *J Archaeol Sci*, **3**, 1-30

Greenacre, M. 1984 *Theory and Applications of Correspondence Analysis*, London (Academic Press)

Greenacre, M. 1993 *Correspondence Analysis in Practice*. London (Academic Press)

Greenacre, M. 1994 Correspondence analysis and its interpretation. in Greenacre and Blasius 1994, 3-22

Greenacre, M. and Blasius, J (eds). 1994 *Correspondence Analysis in the Social Sciences*. London (Academic Press)

Greenwood, D. 1995 *The Bells of the Churches in the Diocese of Wakefield*. Huddersfield

Guilding, Rev J M (ed). 1892 *Reading Records: Diary of the Corporation; Volume I, Henry VI to Elizabeth (1431-1602)*. London and Oxford

Gunton, S. 1686 *The History of the Church of Peterburgh*. London (Richard Chiswell)

HMC. 1887 *The Manuscripts of the Corporations of Southampton and King's Lynn, Eleventh Report, Appendix (Part III)*. London

Hadley, G. 1976 *Citizens and Founders: a history of the Worshipful Company of Founders, London, 1365 – 1975*. Chichester

Haines, Rev H. 1861 *A Manual of Monumental Brasses: comprising an introduction to the study of these memorials and a list of those remaining in the British Isles*. London

Halekoh, U. and Vach, W. 2004 A Bayesian approach to seriation problems in archaeology. *Computational Statistics and Data Analysis*. **45**. 651–73

Halls, P A M. and Dawson, G A. 1998 *The Church Bells of Derbyshire: Part One*. Loughborough

Halls, P A M. and Dawson, G A. 1999 *The Church Bells of Derbyshire: Part Two*. Loughborough

Halls, P A M. and Dawson, G A. 2000 *The Church Bells of Derbyshire: Part Three*. Loughborough

Harris, B E (ed). 1980 *The Victoria History of the Counties of England, a History of the County of Chester: volume 3*. London

Hartigan, J A. 1975 *Clustering Algorithms*. London (Wiley)

Hartopp, H. 1927 *Register of the Freemen of Leicester: 1196 - 1770*. Leicester

Hartopp, H. 1936 *Roll of the Mayors and Lord Mayors of Leicester: 1209 - 1935*. Leicester

Harvey, J. 1974 *Mediaeval craftsmen*. London

Hasted, E. 1801 *The History of the Antient and Metropolitical City of Canterbury, Civil and Ecclesiastical*. 2 vols. Canterbury

Hawes, T. 1986 An index to Norwich City Officers 1453-1835. *Norfolk Record Soc.* **52**

Hawkins, C H. 1938 *Notes taken from a collection of Inscriptions on Ancient and Interesting Suffolk Church Bells*, unpubl typescript Suffolk Record Office (Bury St Edmunds)

Hawthorne, J G. and Smith, C S. 1963 *On Divers Arts: the treatise of Theophilus*. Chicago and London (University of Chicago Press)

Helmholz, R H. 1974 *Marriage Litigation in Medieval England*. Cambridge

Hertzog, I. and Scollar, I. 1988 Ein 'Werkzeugkasten' für Seriation und Clustreanalyse. *Archäologisches Korrespondenzblatt*, **17**, 273-9

Hertzog, I. and Siegmund, F. 1991 Clusteranalyse räumlicher Daten mit Hilfe der Gemeinsamen-Nachbarschafts-Gruppierung (GN-Gruppierung). *Prähistorische Zeitschrift*, **66**, 219-34

Hibbert, W N. 1925 *History of the Worshipful Company of Founders of the City of London*, privately printed

Hills, A. 1934 The Capell Helm and a recently discovered Sacring Bell. *Trans Essex Archaeol Soc*, 2 ser. **21**, 209-18

Hines, J. 1999 *Introduction: studies in early-medieval chronology*, in Hines *et al* 1999, vii-x

Hines, J, Høilund Nielsen, K, and Siegmund, F. 1999 *The Pace of Change: studies in early medieval chronology*, Oxford

Hobhouse, Right Rev Bishop, 1890 Churchwardens' accounts of Croscombe, Pilton, Yatton, Tintinhull, Morebath, and St Michael's, Bath ranging from AD 1349 to 1560. *Somerset Record Soc*, **4**, London

Hodgkinson, R F B. 1939 *The Account Books of the Gilds of St George and of St Mary in the Church of St Peter Nottingham*, Nottingham

Hodson, F R. 1971 Numerical typology and prehistoric archaeology, in *Mathematics in the Archaeological and Historical Sciences* (eds F R Hodson, D G Kendall, and P Tautu), 30-45, Edinburgh (Edinburgh University Press)

Hodson, F R. and Tyers, P A. 1988 Data analysis for archaeologists: the Institute of Archaeology packages, in *Computer and Quantitative Methods in Archaeology 1988* (ed S P Q Rahtz), BAR Int Ser. **446**, 31-41

Hodson, F R, Sneath, P H A, and Doran, J E. 1966 Some experiments in the numerical analysis of archaeological data. *Biometrika*, **53**, 311-24

Holland, Rev W. 1895 *Cratfield: A Transcript of the Accounts of the Parish, from AD 1490 to AD 1642, with notes*, London

Hollis, D. 1949 *Calendar of the Bristol Apprentice Book 1532-1565: Part I. 1532-1542*, Bristol

Holm-Olsen, I M, 1988 The archaeological survey of North Norway: an evaluation using correspondence analysis, in Madsen 1988, 61-70

Holmes, D A, 1980 *Towers with Three Bells or Less in the Basingstoke Area*, Oxford

Holmes, D A, 1987 *Church bells of the Basingstoke District*, Overton

Holmes, D A, 1989 *A short history of the bells at All Hallows church, Whitchurch*, the author

Huber, B, 1941 Aufbau einer Mitteleuropäischen Jahrringschronologie, *Mitteilungen des Hermann Göring Akademie*, **1**, 110-25

Hudson, Rev W, and Tingey, J C, 1906 *The records of the City of Norwich: volume 1*, Norwich

Hudson, Rev W, and Tingey, C A, 1910 *The records of the City of Norwich: volume 2*, Norwich

Huntley, D J, Godfrey-Smith, D I, and Thewalt, M L W, 1985 Optical dating of sediments, *Nature*, **313**, 105-7

Hutton, D A, 1984 York Bellfounders and their Mortars, *Pharmaceutical Historian*, **14**, 2-5

Ihm, P, 1981 The Gaussian model in chronological seriation, in *X Congreso, UISPP Commission IV*, 108-24, Mexico

Ingleby, I, 1922 *The red register of Lynn*, King's Lynn

Jardine, N, and Sibson, R, 1971 *Mathematical Taxonomy*, London and New York (Wiley)

Jarvis, R A, 1978 Shared near neighbour maximal spanning trees for cluster analysis, in *Proceedings of the fourth International Joint Conference on Pattern Recognition*, 308-13, Kyoto (IEEE)

Jarvis, R A, and Patrick, E A, 1973 Clustering using a similarity measure based on shared near neighbours, *IEEE Trans on Computers*, **22**, 1025-34

Jennings, T S, 1970 *A History of Staffordshire Bells*, Kingston-upon-Thames

Jensen, C K, and Nielsen, K H (eds) 1997 *Burial and Society: the Chronological and Social Analysis of Archaeological Burial Data*, Aarhus (Aarhus Univ Press)

Jewitt, L, 1872a The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **13**, 1-10

Jewitt, L, 1872b The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **13**, 97-104

Jewitt, L. 1872c The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **13**, 171-5

Jewitt, L. 1872d The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **13**, 225-32

Jewitt, L. 1873a The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **14**, 33-40

Jewitt, L. 1873b The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **14**, 103-10

Jewitt, L. 1873c The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **14**, 161-6

Jewitt, L. 1873d The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **14**, 225-30

Jewitt, L. 1873e The Chesterfield Bell Founders and Foundry: a Notice of the Heathcote Family, *The Reliquary*, **16**, 141-6

Jewitt, L. 1874 The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **15**, 115-20

Jewitt, L. 1875a The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **16**, 113-16

Jewitt, L. 1875b The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **16**, 193-6

Jewitt, L. 1876 The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **17**, 112

Jewitt, L. 1877 The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **18**, 109-12

Jewitt, L. 1878a The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **19**, 135-8

Jewitt, L. 1878b The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **19**, 237-42

Jewitt, L. 1879 The Church Bells of Derbyshire, described and illustrated, *The Reliquary*, **20**, 53-4

Jones, P E, 1954 *Calendar of Plea and Memoranda Rolls Preserved among the Archives of the Corporation of the City of London at the Guildhall: AD 1437-1457*, Cambridge

Jones, P E, 1961 *Calendar of Plea and Memoranda Rolls Preserved among the Archives of the Corporation of the City of London at the Guildhall: AD 1458-1482*, Cambridge

Jorgensen, L (ed), 1992 *Chronological studies in Anglo-Saxon England, Lombard Italy, and Vendel Period Sweden*, Copenhagen

Kendall, D G, 1963 A statistical approach to Flinders Petrie's sequence dating, *Bull International Statistics Institute*, **40**, 657-80

Kendall, D G, 1970 A mathematical approach to seriation, *Phil Trans R Soc Lond A*, **269**, 125-35

Kendall, D G, 1971 Seriation from abundance matrices, in *Mathematics in the archaeological and historical sciences* (eds D G Kendall, F R Hodson, and P Tautu), 215-52, Edinburgh

Kennard, A N, 1986 *Gunfounding and Gunfounders: a directory of cannon founders from the earliest times to 1850*, London

Kerry, Rev C, 1883 *A History of the Municipal Church of St Lawrence, Reading*, Reading

Ketteringham, J R, 1987 *Lincoln Cathedral: A History of the Bells, Bellringers, and Bellringing*, Lincoln

Ketteringham, J R, 2000 *Lincolnshire bells and bellfounders*, privately printed

Kilian, M R, van der Plicht, J, and van Geel, B, 1995 Dating raised bogs: new aspects of AMS ^{14}C wiggle matching, a reservoir effect, and climatic change, *Quaternary Science Review*, **14**, 959-66

Kitagawa, H, and van der Plicht, J, 1998 Atmospheric radiocarbon calibration to 45,000 yr BP: Late Glacial fluctuations and cosmogenic isotope production, *Science*, **279**, 1187-90

Kruskal, J B, 1971 Multi-dimensional scaling in archaeology: time is not the only dimension, in *Mathematics in the Archaeological and Historical Sciences* (eds F R Hodson, D G Kendall, and P Tăutu), 119-32, Edinburgh (Edinburgh Univ Press)

Krzanowski, W J, 1988 *Principals of Multivariate Analysis*, Oxford (Clarendon Press)

Kuniholm, P I, Kromer, B, Manning, S W, Newton, M, Latini, C E, and Bruce, M J, 1996 Anatolian tree rings and the absolute chronology of the eastern Mediterranean 2220-718 BC, *Nature*, **381**, 780-3

L'Estrange, J, 1874 *The Church Bells of Norfolk: when, where, and by whom they were made; with the inscriptions on all the bells in the county*, Norwich

L'Estrange, J, and Rye, W, 1888 *Calendar of the freemen of Norwich from 1317 to 1603*, Norwich

Lang, R G (ed), 1993 *Two Tudor subsidy assessment rolls for the City of London: 1541 and 1582*, London Record Soc, **29**

Law, E, 1900 *The New Historical Guide to Hampton Court with a new Historical Catalogue of the pictures*, London

Laxton, R R, 1976 A measure of pre-Q-ness with applications to archaeology, *J Archaeol Sci*, **3**, 43-54

Laxton, R R, 1987 Some mathematical problems in seriation, *Acta Applic Math*, **10**, 213-35

Laxton, R R, and Restorick, J, 1989 Seriation by similarity and consistency, in *Computer Applications and Quantitative methods in Archaeology 1989* (eds S Rahtz and J Richards), BAR Int Ser, 548, 215-25

Lega-Weekes, E, 1909 Introduction to the churchwardens' accounts of South Tawton: Part IV, *Report and Trans Devonshire Ass*, **41**, 361-7

Libby, W F, Anderson, E C, and Arnold, J R, 1949 Age determination by radiocarbon content: worldwide assay of natural radiocarbons, *Science*, **109**, 227-8

Linnaeus, C, 1737 *The families of plants with their natural characters, according to the number, figure, situation, and proportion of all the parts of fructification* (translated by Erasmus Darwin), 2 vols, Lichfield (1787)

Littlehales, H, 1905 The Medieval Records of a London City Church (St Mary at Hill) AD 1420 - 1559, *Early English Text Soc*, **125** & **128**, London

Lockyear, K, 2000 Site finds in Roman Britain: a comparison of techniques, *Oxford J Archaeol*, **19**, 397-423

Lu, X, Guo, Z, Ma, H, Yuan, S, and Wu, X, Data analysis and calibration of radiocarbon dating results from the cemetery of the Marquises of Jin, *Radiocarbon*, **43**, 55-62

Lukis, Rev W C, 1855 On Church Bells with some Notices of Wiltshire Bells, *Wiltshire Archaeol Natur Hist Mag*, **2**, 40-82

Lukis, Rev W C, 1857 *An Account of Church Bells, with Some Notices of Wiltshire Bells and Bell-founders*, London

Lukis, Rev W C, 1871 The Bells Foundry of Gloucester, *J Brit Archaeol Ass*, **27**, 416-23

Lynam, C, 1889 *The Church Bells of the County of Stafford*, Stoke-upon-Trent

Madsen, T (ed), 1988 *Multivariate Archaeology: numerical approaches in Scandinavian Archaeology*, Jutland Archaeol Soc Pub, **21**, Aarhus (Aarhus Univ Press)

McGurk, J J N, 1970 *A Dictionary of Medieval Terms for the use of history students*, Reigate

McHardy, A K, 1977 *The Church in London, 1375 - 1392*, London (London Rec Soc)

McHugh, F, 1999 *Theoretical and Quantitative Approaches to the Study of Mortuary Practice*, BAR Int Ser, **785**

Mahalanobis, P, 1936 On the generalised distance in statistics, *Proc National Institute of Science, Calcutta*, **12**, 49-55

Müller, J. 1996 The use of correspondence analysis for different kinds of data categories: domestic and ritual Globular Amphorae sites in Central Germany. *Analecta Praehistorica Leidensia*, **28**, 217-22

Müller, J. and Zimmermann, A. (eds) 1997 Archäologie und Korrespondenz-analyse. *Internationale Archaölogie*, **23**

Murray, A S. and Wintle, A G. 2000 Luminescence dating of quartz using an improved single-aliquot regenerative-dose protocol. *Radiation Measurements*, **32**, 57-73

North, T. 1876 *The Church Bells of Leicestershire: their inscriptions, traditions and peculiar uses; with chapters on bells and the Leicester bell founders*, Leicester

North, T. 1878 *The Church Bells of Northamptonshire: their inscriptions, traditions and peculiar uses; with chapters on bells and the Northamptonshire bell founders*, Leicester

North, T. 1880 *The Church Bells of Rutland: their inscriptions, traditions and peculiar uses, with chapters on bells and bell founders*, Leicester

North, T. 1882 *The Church Bells of the City and County of Lincoln: their founders, inscriptions, traditions and peculiar uses; with a brief history of church bells in Lincolnshire*, Leicester

North, T. 1883 *The Church Bells of Bedfordshire*, London

North, T. 1884 *The Accounts of the Churchwardens of S. Martin's, Leicester, 1489-1844*, Leicester

North, T. 1886 *The Church Bells of Hertfordshire: their founders, inscriptions, traditions and peculiar uses*, London

Orton, C. 1980 *Mathematics in Archaeology*, London (Collins)

Orton, C. 1992 Quantitative Methods in the 1990s, in *Computer Applications and Quantitative Methods in Archaeology 1991* (eds G Lock and J Moffett), BAR Int Ser. **577**, 137-40

Orton, C R. 1996 Dem dry bones, in *Interpreting Roman London: papers in memory of Hugh Chapman* (eds J Bird, M Hassall, and H Sheldon), Oxbow Monogr, **58**, 199-209

Owen, D M (ed) 1984 The Making of King's Lynn: a documentary survey, *Records of Social and Economic History*, new ser, **9**, Oxford

Owen, Rev T M N, 1899 *The Church Bells of Huntingdonshire: their inscriptions, founders, uses, traditions*, London

Page, W (ed), 1908 *The Victoria History of Hampshire and the Isle of Wight: volume 3*, London

Page, W (ed), 1912 *The Victoria History of the County of York: volume 2*, London

Papageorgiou, I, Baxter, M J, and Cau, M A, 2001 Model-based cluster analysis of artefact compositional data, *Archaeometry*, **43**, 571–88

Parker, J (ed), 1894 *A Glossary of Terms used in Heraldry: a new edition*, Oxford and London

Parkin, Rev C, 1808 *An essay towards a topographical history of the county of Norfolk, volume 9*, London

Parkin, Rev C, 1810 *An essay towards a topographical history of the county of Norfolk, volume 11*, London

Parsloe, G, 1964 *Wardens' Accounts of the Worshipful Company of Founders of the City of London 1497-1681*, London

Pearson, Rev C B, 1880 The churchwardens' accounts of St Michael's, Bath--Fourth part, *Somersetshire Archaeol Natur Hist Soc Proc*, **26**, 101-38

Percy, J W, 1973 York Memorandum Book BY, *Surtees Soc*, **186**

Petrie, W M F, 1899 Sequences in prehistoric remains, *J Anthrop Inst*, **29**, 295-301

Phillimore, W P W (ed), 1905 Abstracts of the *Inquisitiones Post Mortem* relating to Nottinghamshire: volume 1, Henry VII and Henry VIII (1485 to 1546), *Thoroton Soc Rec Ser*, **3**

Pickford, C, 1993 *Bellframes: a practical guide to inspection and recording*, privately printed

Poppleton, J E, 1902 Notes on the Bells of the Ancient Churches of the West Riding of Yorkshire, *Yorkshire Archaeol J*, **16**, 46-83

Poppleton, J E, 1903a Notes on the Bells of the Ancient Churches of the West Riding of Yorkshire, *Yorkshire Archaeol J*, **17**, 1-32

Poppleton, J E, 1903b Notes on the Bells of the Ancient Churches of the West Riding of Yorkshire, *Yorkshire Archaeol J*, **17**, 192-236

Poppleton, J E, 1903c Notes on the Bells of the Ancient Churches of the West Riding of Yorkshire, *Yorkshire Archaeol J*, **17**, 434-62

Poppleton, J E, 1905 Notes on the Bells of the Ancient Churches of the West Riding of Yorkshire, *Yorkshire Archaeol J*, **18**, 88-104

Potter, D E, 1987 *The Bells and Bellringers of York Minster*, York

Raine, J (ed), 1859 The Fabric Rolls of York Minster, *Surtees Soc*, **35**

Raine, J (ed), 1864 Testamenta Eboracensia: a selection of wills from the Registry at York, volume III, *Surtees Soc*, **45**

Raine, J (ed), 1884 Testamenta Eboracensia: a selection of wills from the Registry at York, volume V, *Surtees Soc*, **79**

Ralph, E. and Hardwick, N M (eds), 1980 *Calendar of the Bristol Apprentice Book, 1532-1565: Part II 1542-1552*. Gloucester

Raven, Rev J J, 1869 *The Church Bells of Cambridgeshire*. Lowestoft

Raven, Rev J J, 1882 *The Church Bells of Cambridgeshire*. 2 edn. Cambridge

Raven, Rev J J, 1890 *The Church Bells of Suffolk: with a complete list of the inscriptions on the bells, and historical notes*. London

Raven, Rev J J, 1897 On Some Dorset Bells. *Archaeol J*. **54**, 355-62

Raven, Rev J J, 1902 Notes on Some Nottinghamshire Bells. *Archaeol J*. **59**, 93-9

Raven, Rev J J, 1906a *The Church Bells of Dorset*. Dorchester

Raven, Rev J J, 1906b *The Bells of England*. London

Raven, Rev J J, 1906c The Church Bells of Dorset. *Proc Dorset Natur Hist and Antiq Field Club*, **27**, 93-137

RCHM, 1930 *Royal Commission on Historical Monuments (England): an inventory of the historical monuments in London, volume V, East London*. London (HMSO)

RCHM, 1972 *Royal Commission on Historical Monuments (England): an inventory of the historical monuments in the city of York, volume III, south-west of the Ouse*. Oxford (HMSO)

Read, D W, and Christenson, A L, 1978 Comments on "Cluster analysis and archaeological classification". *American Antiquity*, **43**, 505-6

Rees, I, 1988 *A Glossary of Medieval and Post-medieval terms relating to South Wales*. Cardiff and Swansea

Rich, E E, 1934 *The Staple Court Books of Bristol*. Bristol

Richards, I G, and Oakley, R G, 1966 Medieval Bell Lettering. *Architectural Review*, **140**, 142-4

Riley, H T, 1868 *Memorials of London life*. London

Robinson, W S, 1951 A method for chronologically ordering archaeological deposits. *American Antiquity*, **16**, 293-301

Rowe, M M, and Jackson, A M, 1973 Exeter Freemen: 1266-1967. *Devon and Cornwall Record Soc*, extra ser, **1**

Ruggles, C, 1986 You can't have one without the other? IT and Bayesian statistics and their possible impact within archaeology. *Science and Archaeology*, **28**, 8-15

Rye, W, 1913 *A calendar of the freemen of Lynn, 1292-1836*. Norwich

Salzman, L F, 1923 *English Industries of the Middle Ages*. Oxford

Salzman, L F (ed), 1951 *The Victoria History of the County of Warwick: volume 6*, London

Sayles, G O, 1940 The dissolution of a guild at York in 1306, *English Historical Review*, **55**, 83-98

Scollar, I, Weidner, B, and Herzog, I, 1985 A portable seriation package with dynamic memory allocation in PASCAL, *PACT*, **11**, 149-157

Scollar, I, Herzog, I, and Greenacre, M J, 1993 Color and graphic display aids for correspondence analysis, in *Computing the Past: Computer Applications and Quantitative Methods in Archaeology, CAA92* (eds J Andresen, T Madsen, and I Scollar), Aarhus (Aarhus University Press)

Scott, A, 1993 A parametric approach to seriation, in *Computing the past: CAA92 Computer Applications and Quantitative Methods in Archaeology* (eds J Andresen, T Madsen, and I Scollar), 317-24, Aarhus (Aarhus University Press)

Scott, A, Whittaker, J, Green, M, and Hillson, S, 1991 *Graphical modelling of archaeological data*, in *Computer Applications and Quantitative Methods in Archaeology* (eds K Lockyear and S P Q Rahtz), BAR Int Ser, **565**, 111-16

Scott, A J, and Symons, M J, 1971 Clustering methods based on likelihood ratio criteria, *Biometrics*, **27**, 387-97

Sharpe, F, 1953 *The Church Bells of Oxfordshire: their inscriptions and founders*, Oxford

Sharpe, F, 1965 *The Church Bells of Cardiganshire: their inscriptions and founders*, Brackley

Sharpe, F, 1970 *The Church Bells of Berkshire: their inscriptions and founders*, 2 edn, Bath

Sharpe, F, 1976 *The Church Bells of Herefordshire: their inscriptions and founders and details of bellframes and gear; volumes 1-5*, Brackley

Sharpe, R R, 1889 *Calendar of wills proved and enrolled in the Court of Husting, London, AD 1258 - AD 1688: Part I, AD 1258 - AD 1358*, London

Sharpe, R R (ed), 1890 *Calendar of wills proved and enrolled in the Court of Husting, London AD 1258 - AD 1688: Part II, AD 1358 - AD 1688*, London

Sharpe, R R (ed), 1901 *Calendar of Letter-Books preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-Book C, circa AD 1291-1309*, London

Sharpe, R R (ed), 1902 *Calendar of letter-books preserved among the archives of the Corporation of the City of London at the Guildhall: Letter-book L*, London

Sharpe, R R (ed), 1903 *Calendar of Coroners Rolls of the City of London AD 1300 - 1378*, London

Sharpe, R R (ed), 1904 *Calendar of Letter-Books Preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-Book F, c AD 1337 - 1352*, London

Sharpe, R R (ed), 1905 *Calendar of Letter-Books Preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-Book G, c AD 1352-1374*, London

Sharpe, R R (ed), 1907 *Calendar of Letter-Books preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-book H, c AD 1375-1399*, London

Sharpe, R R (ed), 1909 *Calendar of letter-books preserved among the archives of the Corporation of the City of London at the Guildhall: letter-book I, circa AD 1400-22*, London

Sharpe, R R (ed), 1911 *Calendar of letter-books preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-book K, temp Henry VI*, London

Sharpe, R R (ed), 1912 *Calendar of letter-books preserved among the Archives of the Corporation of the City of London at the Guildhall: Letter-book L, temp Edward IV-Henry VII*, London

Shennan, S, 1988 *Quantifying Archaeology*, Edinburgh (Edinburgh University Press)

Skaife, R H, 1872 The Register of the Guild of Corpus Christi in the City of York, *Surtees Soc*, **57**

Smith, C S, and Gnudi, M T (eds), 1990 *The Pirotechnia of Vannoccio Biringuccio: the classic sixteenth-century treatise on metals and metallurgy*, New York (Dover)

Smith, D M (ed), 1988 Ecclesiastical Cause Papers at York: the Court of York 1301-1399, *Borthwick Texts and Calendars*, **14**

Smith, D M (ed) 1990 A Guide to the Archives of the Company of Merchant Adventurers of York, *Borthwick Texts and Calendars*, **16**

Smith, J C C, 1893 *Index of wills proved in the prerogative court of Canterbury 1383-1558*, London

Sneath, P, and Sokal, R, 1973 *Numerical taxonomy*, San Francisco (W H Freeman)

Sokal, R, and Sneath, P, 1963 *Principals of numerical taxonomy*, San Francisco (W H Freeman)

Stahlschmidt, J C L, 1884 *Surrey Bells and London Bellfounders*, London

Stahlschmidt, J C L, 1886 Notes from an old city account book, *Archaeol J*, **43**, 162-76

Stahlschmidt, J C L, 1887 *The Church Bells of Kent: their inscriptions, founders, uses and traditions*, London

Stahlschmidt, J C L, 1889 Robert Burford of London, Bellfounder, *Trans Essex Archaeol Soc*, new ser, **3**, 238-40

Steier, P, and Rom, W, 2000 The use of Bayesian statistics for ^{14}C dates of chronologically ordered samples: a critical analysis, *Radiocarbon*, **42**, 183-98

Steuer, H, 1990 Review of Die transalpinen Verbindungen der Bayern, Alemannen und Franken bis zum 10, Jahrhundert (eds H Beumann and W Schröder), *Fundberichte Baden-Württemberg*, **15**, 494-503

Stevenson, W H, 1883 *Records of the Borough of Nottingham being a series of extracts from the Archives of the Corporation of Nottingham: volume II, King Henry IV to King Richard III, 1399-1485*, London

Stevenson, W H, 1885 *Records of the Borough of Nottingham being a series of extracts from the Archives of the Corporation of Nottingham: volume III, King Henry VII to King Henry VIII, 1485-1537*, London

Stevenson, W H, 1893 *Calendar of the Records of the Corporation of Gloucester*, Gloucester

Stewart-Brown, R, 1913 Notes on Childwall, *Trans Hist Soc Lancashire Cheshire*, **65**, 47-170

Stiff, W P W, 1872 Notes on Nottinghamshire Campanology, *The Reliquary*, **13**, 81-94

Stiff, W P W, 1878a The Church Bells of Nottinghamshire, *The Reliquary*, **19**, 169-75

Stiff, W P W, 1878b The Church Bells of Nottinghamshire, *The Reliquary*, **19**, 113-5

Stiff, W P W, 1879 The Church Bells of Nottinghamshire, *The Reliquary*, **20**, 33-8

Struckett, D, 1985 *A Dictionary of Campanology*, privately printed

Swanson, H, 1989 *Medieval Artisans: an urban class in late medieval England*, Oxford

Taylor, R E, and Aitken, M J (eds), 1997 *Chronometric dating in archaeology*, New York (Plenum)

Thomas, A H (ed), 1924 *Calendar of the Early Mayor's Court Rolls preserved among the Archives of the Corporation of the City of London at the Guildhall, AD 1298-1307*, Cambridge

Thomas, D H, 1978 The awful truth about statistics in archaeology, *American Antiquity*, **43**, 231-44

Thompson, B L, 1970 Westmorland Church Bells, *Trans Cumberland Westmorland Antiq Archaeol Soc*, new ser, **70**, 51-68

Thurlow, Rev G, 1947 *Church Bells and Ringers of Norwich*, Norwich

Tilley, Rev H T, 1878 The Church Bells of Warwickshire, *Trans Birmingham and Midland Institute (Archaeology Section)*, **9**, 10-18

Tilley, Rev H T, and Walters, H B, 1910 *The Church Bells of Warwickshire, their founders, traditions, inscriptions and uses*, Birmingham

Tringham, N J (ed), 1993 Charters of the Vicars Choral of York Minster: City of York and its suburbs to 1546, *Yorks Archaeol Soc Record Ser*, **148**

Tymms, S, 1850 Wills and Inventories from the registers of the Commissary of Bury St Edmunds and the Archdeacon of Sudbury, *Camden Soc*, **49**, London

Tyssen, A D, 1864 *The Church Bells of Sussex, with the inscriptions on all the bells in the county*, Lewes

Tyssen, A D, 1891 Confirmation by Thomas, Archbishop of Canterbury, of the church of Bexley, Kent, with certain tithes and other rights and priviledges, to the canons of the priory of the Holy Trinity, London, *Archaeol J*, **48**, 83-9

Tyssen, A D, 1908 John Barbor of Salisbury, Brasier, *Wilts Archaeol Natur Hist Mag*, **35**, 351-69

Tyssen, A D, 1915 *The Church Bells of Sussex, with the inscriptions on all the bells in the county and a jubilee article written thereon in 1914*, Lewes

Tyssen, A D, 1922 On the Ancient Bell at Grocer's Hall, *Trans London Middlesex Archaeol Soc*, new ser, **4**, 180-2

Veale, E W W, 1931 *The Great Red Book of Bristol: Introduction (part I)*, Bristol

Veale, E W W, 1933 *The Great Red Book of Bristol: Text (part I)*, Bristol

Veale, E W W, 1953 *The Great Red Book of Bristol: Text (part IV)*, Bristol

Vidler, L A, 1934 *A New History of Rye*, Hove

Vogt, W P, 1993 *Dictionary of Statistics and Methodology: non-technical guide for the Social Sciences*, London (Sage)

Voorrips, A, 1987 Formal and Statistical Models in Archaeology, in *Quantitative Research in Archaeology* (ed M S Aldenderfer), 61-72, Beverly Hills (Sage)

Wadley, Rev T P, 1886 *Notes or Abstracts of the Wills in the volume entitled the Great Orphan Book or Book of Wills in the Council House of Bristol*, Bristol

Walters, H B, 1893 The Church Bells of Gloucestershire, *Trans Bristol Gloucestershire Archaeol Soc*, **18**, 218-51

Walters, H B, 1897 The Church Bells of Gloucestershire II, *Trans Bristol Gloucestershire Archaeol Soc*, **20**, 222-32

Walters, H B, 1906a Some Notes on Worcestershire Bellfounders, *Archaeol J*, 2 ser, **13**, 187-93

Walters, H B, 1906b London Church Bells and Bellfounders, *Trans St Paul's Ecclesiological Soc*, **6** (1906-10), 101-28

Walters, H B, 1908 Church Bells, London

Walters, H B, 1911 The Gloucestershire Bell-Foundries, *Trans Bristol Gloucestershire Archaeol Soc*, **34**, 110-9

Walters, H B, 1912 *The Church Bells of England*, London

Walters, H B, 1915 *The Church Bells of Shropshire: their founders, inscriptions, traditions, and uses*, Oswestry

Walters, H B, 1918 The Gloucestershire Bell-Foundries II - The Bristol Foundry, *Trans Bristol Gloucestershire Archaeol Soc*, **41**, 49-86

Walters, H B, 1926a A Dated Medieval Bell from Minchinhampton, Glouc, *Antiq J*, **6**, 294-303

Walters, H B, 1926b Some Thirteenth-century English Bells, *Antiq J*, **6**, 416-31

Walters, H B, 1929 *The Church Bells of Wiltshire: their inscriptions and history*, Devizes

Walters, H B, 1932 *The Church Bells of Worcestershire: their inscriptions and history*, Worcester

Walters, H B, 1939a Dorset Church Bells, *Dorset Natur Hist Archaeol Soc Proc*, **60**, 97-120

Walters, H B, 1939b *London Churches at the Reformation with an account of their contents*, London

Whallon, R, 1984 Unconstrained clustering for the analysis of spatial distributions in archaeology, in *Intra-site spatial analysis in archaeology* (ed H Hietala), 242-77, Cambridge (Cambridge University Press)

Whallon, R, 1990 Defining structure in clustering dendrograms with multilevel clustering, in *New tools from mathematical archaeology* (eds A Voorrips and B S Ottaway), 1-13, Warsaw (Polish Academy of Sciences)

Whitehead, Rev H, 1883 Church Bells in the Archdeaconry of Brampton, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **6**, 417-43

Whitehead, Rev H, 1884 Church Bells on the 'Border', *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **7**, 221-36

Whitehead, Rev H, 1886a The Bells of Carlisle Cathedral, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **8**, 135-65

Whitehead, Rev H, 1886b Church Bells in Cumberland Ward, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **8**, 505-31

Whitehead, Rev H, 1888 Church Bells in Leath Ward, No I, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **9**, 475-96

Whitehead, Rev H, 1891a Church Bells in Leath Ward, No II, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **11**, 127-51

Whitehead, Rev H, 1891b Keswick Town Clock Bell, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **11**, 152-7

Whitehead, Rev H, 1895a Church Bells in Leath Ward, No III, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **13**, 194-217

Whitehead, Rev H, 1895b Church Bells in Leath Ward, No IV, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **13**, 310-42

Whitehead, Rev H, 1897a Church Bells in Leath Ward, No V, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **14**, 259-74

Whitehead, Rev H, 1897b The Bells of Brigham, Cockermouth, Crosthwaite, Distington and Holme Cultram, *Trans Cumberland Westmorland Antiq Archaeol Soc*, old ser, **14**, 275-334

Wilkinson, E M, 1974 Techniques of data analysis: seriation theory, *Archaeo-Physika*, **5**, 1-142

Wilkinson, Rev R F, 1929 The Church Bells of Nottinghamshire, *Trans Thoroton Soc Nottinghamshire*, **33**, 95-129

Wilkinson, Rev R F, 1931 The Church Bells of Nottinghamshire, *Trans Thoroton Soc Nottinghamshire*, **35**, 39-69

Williams, J F, 1913 *The Early Churchwardens' Accounts of Hampshire*, Winchester and London

Witts, Rev F E B, 1882 Old Bells in Gloucestershire Belfries, *Trans Bristol Gloucestershire Archaeol Soc*, **7**, 56-68

Yeatman, P (ed), 1884 *Records of the Borough of Chesterfield*, Chesterfield and Sheffield

Zeidler, J A, Buck, C E, and Litton, C D, 1998 Integration of archaeological phase information and radiocarbon results from the Jama River valley, Ecuador: a Bayesian approach, *Latin American Antiquity*, **9**, 160-79

GLOSSARY *containing technical terms relating to bells and bellfounding, mathematical modelling, and medieval documents. For further information the reader is referred to Struckett (1985), Vogt (1993), McGurk (1970), and Rees (1988).*

ABSOLUTE CONTRIBUTIONS the proportion of the INERTIA of a particular dimension explained by a particular point in a CORRESPONDENCE ANALYSIS. This measures forms part of the DECOMPOSITION OF THE CHI-SQUARED STATISTIC.

ADVOWSON the right of appointing a clergyman to a living.

AGGLOMERATIVE a clustering algorithm which gradually combines UNITS into larger groups.

ALIENATION the transferal of land from one holder to another.

ARGENT the central boss on the crown of a bell around which the CANONS are grouped.

ASSIZE a statutory regulation or law.

ASSOCIATION, STATISTICAL a relationship between two or more categorical VARIABLES that can be described statistically.

ATTRIBUTE a VARIABLE (also called a DISCRETE or NOMINAL VARIABLE), which distinguishes between subjects by putting them into a limited number of categories, forming CATEGORICAL DATA.

AUGMENTATION the addition of extra bells to an existing RING.

BAYESIAN INFERENCE statistical inference based on Bayes' theorem and on the researcher's beliefs about the topic being studied (see PRIOR and POSTERIOR PROBABILITIES).

BELL METAL a bronze of specific composition used for casting bells, containing 20-23% tin.

BOROUGH a town possessed of certain privileges, municipal or parliamentary.

CAMPANIST one who studies bells and bellfounding.

CANON loops cast on the CROWN of a bell enabling the attachment of the HEADSTOCK by iron straps.

CAST-IN CROWN STAPLE an iron hook or bracket, secured at the time of casting the bell, from which the CLAPPER is hung.

CATEGORICAL DATA a set ATTRIBUTES (DISCRETE or NOMINAL VARIABLES).

CENTROID the average value of the scores of the members of a cluster on each relevant ATTRIBUTE; more intuitively, the centre of a cluster. Also, the origin of the co-ordinate system used in a CORRESPONDENCE ANALYSIS, the weighted mean of all the row and column profiles.

CHAIN a series of values in which a value at one point depends in some way on the previous values in the series.

CHAMBERLAIN civil office with responsibility for finance.

CHANTRY the office or benefice maintained to say masses for the souls of the founders.

CLAPPER an iron hammer, forged with a ball towards the end to strike the bell, suspended on a BALDRICK from the CAST IN CROWN STAPLE beneath the CROWN of a bell.

CLASSICAL STATISTICAL INFERENCE statistical inference not based on the BAYESIAN paradigm. An approach to statistics based on a frequency view of probability in which it is assumed that it is possible to consider a infinite sequence of independent repetitions of the same statistical experiment.

CLASSIFICATION a systematic arrangement in a class or classes.

CLUSTER ANALYSIS any of several procedures in MULTIVARIATE analysis designed to determine whether UNITS are similar enough to fall into groups or clusters.

COEFFICIENT a number used as a measure of property or characteristic.

CONSTABLE civil office, principally concerned with law and order.

CONTINGENCY TABLE a table of frequencies classified according to two or more sets of CATEGORICAL VARIABLES.

CONTINUOUS DATA a set of variables which can be expressed by a large (often infinite) number of measures.

CORONER civil office to look after the king's interests, for example, by valuing forfeit chattels, holding inquests into deaths, investigating wrecks at sea and buried treasure.

CORRELATION the extent to which two or more entities are related.

CORRELATION COEFFICIENT a number showing the degree to which two CONTINUOUS VARIABLES are related.

CORRESPONDENCE ANALYSIS a method for displaying the relationships between categorical variables in a type of scatterplot diagram.

CROWN the top of a bell extending to the SHOULDER.

DECOMPOSITION OF THE CHI-SQUARED STATISTIC the collective terms for the diagnostic statistics produced by CORRESPONDENCE ANALYSIS, comprising the ABSOLUTE CONTRIBUTIONS, SQUARED CORRELATIONS, and QUALITY of each point.

DISCRETE VARIABLE an ATTRIBUTE.

DISCRIMINANT ANALYSIS a form of REGRESSION analysis designed for classification, allowing two or more CONTINUOUS INDEPENDENT VARIABLES to be used to place UNITS into the categories of a CATEGORICAL DEPENDENT VARIABLE.

DISTRIBUTION a ranking, from lowest to highest, of the values of a VARIABLE and the result pattern of measures or scores.

DIVISIVE a clustering algorithm which gradually divides UNITS into smaller groups.

EDWARDIAN INVENTORIES in 2 Edward VI (1548-9) a commission was appointed to make enquiry into the quantity and value of Church furnishings throughout England (including bells). This commission was renewed and expanded in 6 Edward VI (1552-3).

EIGENVALUE a statistic used to indicate how much of the variation in the original group of variables is accounted for by a particular dimension.

ESCUTCHEON a shield with armorial bearings.

EUCLIDEAN DISTANCE the straight-line distance between two points in ordinary, two or three dimensional space.

FEE SIMPLE land held without restriction on inheritance.

FEET OF FINE a final agreement concerning landholding, lodged in the court of common pleas.

FOUNDRY MARKS small marks, signs, or insignias which indicate the founder of a bell.

GILD a corporation of merchants or craftsmen inside a borough.

GOODNESS-OF-FIT how well a MODEL matches actual data (in Classical statistics).

GUARDIANS OF THE PEACE civic office with responsibility for upholding the peace, foreshadowing the later Justice of the Peace.

HANG to fit a bell with the necessary gear to allow it to be rung from a tower or turret.

HUSTINGS a court of law known in only a few cities and towns, particularly the City of London's chief court.

INCIDENCE MATRIX a data matrix containing the values 1 and 0, 1 indicating the presence of a TYPE in a UNIT, and 0 its absence.

INDENTURE a document on a single sheet, cut through in a series of indentations to produce two counterparts for authentication.

INSCRIPTION BAND the area immediately below the shoulder of a bell where the INSCRIPTION is usually place, demarcated by MOULDING WIRES.

LATENT CLASS ANALYSIS a method similar to factor analysis used with CATEGORICAL DATA.

LIP the edge of a bell around the MOUTH.

MAIDEN BELL a bell which has never been TUNED.

MATRIX a rectangular array of data in rows and columns.

MESSUAGE land occupied for a dwelling house and its appurtenances.

METRIC any standard or scale of measurement.

MISSING DATA information not available for a UNIT.

MODEL a representation of something which aids in understanding it; a set of assumptions about relationships used to study their interactions.

MONTE CARLO METHODS any generation of random values to study statistical MODELS.

MORTMAIN lands or tenements held inalienably by an ecclesiastical or other corporation.

MOULD the shaped and prepared cavity in which a bell is cast.

MOULDING WIRES cast-in lines around a bell, parallel with the LIP.

MULTIVARIATE ANALYSIS any method used for examining multiple VARIABLES at the same time.

NOISE a random error.

NOMINAL VARIABLE an ATTRIBUTE.

ORDINATION arranging UNITS or TYPES into an order.

ORTHOGONAL at right angles.

OUTLIER a UNIT that has extreme values on a VARIABLE.

PARAMETER (a) a limit or boundary or (b) a characteristic or element.

POPULATION a group of UNITS that one wishes to describe.

QUALITY the goodness of fit of each point's representation in a CORRESPONDENCE ANALYSIS. This is the sum of the SQUARED CORRELATIONS for the point. This measure is part of the DECOMPOSITION OF THE CHI-SQUARE STATISTIC.

QUITCLAIM to release from an obligation or give up the rights to land.

REBUS a maker's mark, usually a cryptogram of a name.

RECAST to melt down a bell (usually after breaking it up first) and casting it in a newly prepared MOULD.

REGRESSION any of several statistical techniques concerned with predicting some VARIABLES by knowing others.

RING (n) a set of tower bells (v) to sound a bell by full circle swinging.

ROBUST said of a statistic which remains useful even when one (or more) of its assumptions is violated.

SANCTUS BELL a small church bell, often hung in a separate turret, rung to announce the beginning of the Canon of the Mass.

SERIATION the ordering of items on the basis of their intrinsic properties.

SHERIFF local official, head of the fiscal, administrative, judicial, and military organisation of the shire.

SOUNDBOW the thickest part of the shape of a bell where the CLAPPER strikes.

SQUARED CORRELATIONS the proportion of the INERTIA of a particular point explained by a particular dimension in CORRESPONDENCE ANALYSIS. This measure forms part of the DECOMPOSITION OF THE CHI-SQUARE STATISTIC.

STRICKLE a curved piece of wood forming the profile of a bell, used to mould the core and cope moulds during casting.

SUBSIDY a parliamentary grant to the crown.

TALLAGE ROLL a record of taxes.

TENOR the largest bell with the lowest note in a RING of bells.

TOFT the site of a house and its outbuildings, sometimes including attached arable land.

TOTAL INERTIA a measure of the extent to which points are spread around the CENTROID of a CORRESPONDENCE ANALYSIS.

TREBLE the smallest bell with the highest note in a RING of bells.

TUNE to alter the notes of a bell by removing metal after casting.

TYPE an ATTRIBUTE which can be present or absent on a UNIT; in this study the TYPES are FOUNDRY MARKS.

UNIT an individual which may have TYPES; in this study the UNITS are bells.

VARIABLE an ATTRIBUTE or characteristic that can change.

WAIST the part of a bell immediately below the CROWN, which is most parallel and of relatively constant thickness.

Table 1: bells with independent evidence for the place of manufacture and bearing the common generic formulae (see Fig 9 for key); shaded cells are formulae only documented with one foundry

	Aish Priors	Bristol	Bury St Edmunds	Chertsey/Reading/ Wokingham	Chesterfield	Exeter	Leicester	Lincoln	London	King's Lynn	Norwich	York	Row Total
001	-	46	82	37	7	4	10	5	166	3	7	-	**367**
002	5	21	-	11	-	1	1	6	8	-	2	-	**55**
003	-	-	-	2	-	-	-	-	25	-	18	-	**45**
006	8	-	4	12	-	2	-	1	-	1	8	-	**36**
008	-	-	-	-	-	-	-	1	21	-	1	-	**23**
011	-	2	1	3	11	1	2	4	8	-	2	5	**39**
016	-	-	-	2	2	-	-	2	48	-	-	-	**54**
023	-	-	-	-	-	-	2	-	41	11	5	14	**73**
029	-	-	-	-	-	2	-	2	15	-	-	-	**19**
033	-	-	-	1	-	-	-	2	3	1	-	-	**7**
043	-	-	-	-	-	-	-	4	2	-	5	-	**11**
059	-	-	-	-	-	-	-	-	-	**1**	-	-	**1**
060	-	-	1	1	-	-	-	10	3	-	1	4	**20**
061	-	-	-	1	-	-	-	1	3	-	1	-	**6**
072	-	-	-	-	-	**9**	-	-	-	-	-	-	**9**
078	-	-	-	-	2	-	1	5	1	-	-	-	**9**
081	-	-	-	-	-	**6**	-	-	-	-	-	-	**6**
101	1	-	-	2	-	2	-	-	-	-	5	-	**10**
102	-	1	-	-	1	-	1	-	5	3	3	-	**14**
114	-	-	-	-	1	-	2	-	1	-	-	-	**4**
480	-	-	-	-	-	**18**	-	-	-	-	-	-	**18**
498	-	-	-	-	-	-	-	-	-	-	**27**	-	**27**
610	-	-	-	2	-	-	-	-	24	-	18	-	**44**
Total Column	**14**	**70**	**88**	**74**	**24**	**45**	**19**	**43**	**374**	**20**	**103**	**23**	**897**

Table 2: bells inscribed with their date of casting but not the name of their founder

Location	Bell Number	Type of inscribed date	Date	Language of inscription
Lisset,Yorkshire (East Riding)	4058	Roman numerals	1254	-
Claughton, Lancashire	1813	Roman numerals & latin words	1296	Latin
Duncton, Sussex	3539	Roman numerals	1369	French
Hatton, Warwickshire	3670	Roman numerals	1403	Flemish
Hexham, Northumberland	2422-4	Roman numerals	1404	Latin
Goldsbrough, Yorkshire (West Riding)	4169	Roman numerals	1407	Latin
Thirsk, Yorkshire (West Riding)	4346	Latin words	1410	Latin
South Somercotes, Lincolnshire	2217-8	Roman numerals	1423	Latin
Somerby, Lincolnshire	2204	Roman numerals & latin words	1431	Latin
Leeds Castle, Kent	1731	Roman numerals	1435	French
Whitton, Suffolk	3450	Roman numerals	1441	Latin
Lichfield, St Chad	3062	Arabic numerals	1455	Latin
London, All Hallows Staining	2304	Roman numerals	1458	Flemish
St Michael on Wyre, Lancashire	1827	Roman numerals	1458	French
Holme Cultram, Cumberland	0377	Roman numerals	1465	Latin
Worcester, St Michael	3978	Roman numerals	1480	Latin
Salhouse, Norfolk	4670	Roman numerals	1481	Latin
Maidwell, Northamptonshire	2364	Latin words	1482	Latin
Grimley, Worcestershire	3929	Roman numerals	1482	Latin
Eglingham, Northumberland	2418	Roman numerals	1489	Flemish
Durham Castle gatehouse	0924	Arabic numerals	1495	Latin
Grasby, Lincolnshire	2057	Arabic numerals	1500	English
Spalding, Lincolnshire	2220	Roman numerals	1501	Latin
Canterbury, St Mary Bredin	1676	Arabic numerals	1505	Latin
Rayleigh, Essex	1113	Arabic numerals	1508	Latin
Downe, Kent	1696	Roman numerals	1511	Latin
Huyton, Lancashire	1822	Arabic numerals	1512	Latin
Minchinhampton, Gloucestershire	1254	Roman numerals	1515	English
Isleham, Cambridgeshire	0251-2	Arabic numerals	1516	-
Aldbourne, Wiltshire	3751	Roman numerals	1516	Latin
Tong, Shropshire	2718	Arabic numerals	1518	Latin
York, St Crux	4114	Roman numerals	1523	Flemish
Leaden Roothing, Essex	1062	Arabic numerals	1523	English
Rayne, Essex	4785	Roman numerals	1528	Flemish
Bruton, Somerset	2761	Roman numerals	1528	Latin
Sullington, Sussex	3608	Roman numerals	1529	Latin
Keynsham, Somerset	2871	Roman & Arabic numerals	1531	-
Boldon, Co Durham	0914	Roman numerals	1536	Latin

Table 3: bells inscribed with initials which occur only rarely

Location	Bell Number	Initials
Whitburn, Co Durham	0951-2	as
Fritton, Norfolk	4470	ER
Sydling, Dorset	0872	FG
Hoggeston, Buckinghamshire	0147	HW
Bishop Middleton, Co Durham	0913	HF
Sproughton, Norfolk	3388	IH
Sproatley, Yorkshire (East Riding)	4085	IK
Radclive, Buckinghamshire	0174	KV
Kiddington, Oxfordshire	2576	MW
York, St Sampson	4122	RB
Terrington, Yorkshire (North Riding)	4344	TO
Hootton Roberts, Yorkshire (West Riding)	4174	TW
Distington, Cumberland	0362	UC
Castle Frome, Herefordshire	1479	WF
Stowting, Kent	1790	WP
Pitcombe, Somerset	2932	WS
Buscot, Berkshire	0057	WW

Table 4: bells inscribed with single initials (see above fn00 for "R")

Location	Bell Number	Initials
Little Totham, Essex	1085	A
Haselbury Bryan, Dorset	0802	P
Curry Mallet, Somerset	2810	S
Old Beckermet, Cumberland	0389-90	T
Woodbury, Devon	0478	T
Sutton Montis, Somerset	2980	V
Almer, Hampshire	0744	W
Bloxham, Oxfordshire	2540	W
Caldecot, Cambridgeshire	0207	W
Lillington, Dorset	0811	W
Minstead, Hampshire	1383	W
Weeke (St Barnabas), Hampshire	1423	W
Weeke (St Mary), Hampshire	1422	W

Table 5: bells bearing the names of people whose appearance in documents can be used to provide indications of the date of casting (those mentioned in the main text have been omitted)

Location	Bell Number	Evidence	Ascribed date
Kenilworth, Warwickshire	3674	bears name of Thomas Kidderminster, prior of St Mary's, Kenilworth 1403-39 (Salzman 1951, 141-2).	1403-39
Caversfield, Oxfordshire	2551	bears name of Hugh Gargate and Sybil his wife, Hugh succeeded to the manor *c*1180, being documented in possession in 1199 (*Ringing World* **LXVI**, 502), 1207 (Walters 1926b, 423-4), and 1216; Sybil was widowed by 1219 (Sharpe 1953, 72-80).	*c* 1180-*c* 1219
Fladbury, Worcestershire	3926	bears name of Edward Gregson, Rector here 1503-57 (Walters 1932, 120-1).	1503-57
Ripon Minster	4200	bears name of Alexander, Bishop of York; Alexander Neville held the see 1373-88 (Poppleton 1903b, 225-8).	1373-88
Chester Cathedral	0284	bears name Abbot Birchenshaw of Chester, elected 1493, resigned 1524, restored 1529/30, and resigned again 1538 (Harris 1980, 145).	1493-1524 or 1529/30-8
Silton, Derbyshire	0857	donated by W Bidyck and IG, Rector; John Gardener was appointed Rector of Silton in 1412 during the minority of W Bidyck and held the benefice until 1433 (Raven 1906a, 75)	1412-33
Chester-le-Street, Co Durham	0916-7	bears name of John de Ashburn, dean of Chester-le-Street in 1409; donated by John Lumley, 1405-21 (Fowler 1865, 269).	*c* 1409; 1405-21
Gainford, Co Durham	0932	bears name of Roger de Kirkby, vicar of Gainford 1401-12 (North 1876, 19).	1401-12
Harringworth, Northamptonshire	2355	bears name of Philip, Bishop of Lincoln; Philip de Repington held the see 1405-20 (North 1880, 44).	1405-20
Carlton in Lindrick, Nottinghamshire	2453	bears name of William Chambers, rector 1417-43 (Dawson 1994, 37).	1417-43
Kirkwhelpingham, Northumberland	2426	bears name of Robert Watson, recorded as vicar here on 16 November 1501 and 1 June 1506 (Blair 1891h, 158-9).	*c* 1501-6
Waberthwaite, Cumberland	0404-5	bear the names of Henry VI (1422-71) and Thomas Walker, rector here from 1429 and still alive in 1473 (Fair 1949; 108, 112).	1429-*c* 1473
Woolley, Yorkshire (West Riding)	4239	bears name of Lord Richard Woodrove, who purchased Woolley Hall in 1489 and died in 1522 (Poppleton 1903c, 460).	1489-1522
Lamplugh, Cumberland	0381	bears name of Sir Thomas Lamplugh, High Sheriff of Cumberland 1460-71 (Fair 1951, 209-10).	1460-71
Warmfield, Yorkshire (West Riding)	4233	bears name of John de Bardsay, Abbot of Kirkstall *c* 1392-9 (Greenwood 1995, 149-50), not John de Berdesay (died 1313)(*pace* Poppleton 1903c, 459).	*c* 1392-9
Lovington, Somerset	2898	bears name of John Locker, documented *c* 1450-70 (Walters 1939a, 102).	*c* 1450-70
Coventry (St John Baptist), Warwickshire	3660	bears names of John Mallery and Alexander Yo, vicar of Kyrkby; John Mallery of Winwick, Northamptonshire married Alice Revel of Newbold Revel *c* 1360, their son, also John Mallery succeeded in 1382 and became Commissioner for the peace in 1391 (Tilley and Walters 1910, 14-15).	*c* 1360-*c* 1391
Stoneleigh, Warwickshire	3700	bears the initials "RK" and "Wynchelcumbam"; Richard Kydermynseter was Abbot of Winchcombe	1488-1531

		1488-1531 (Ellacombe 1881, 11-12).	
Winstone, Gloucestershire	1308	bears name of Elizabeth de Burgh, daughter of Gilbert Clare, seventh Earl of Gloucester, was born in the last decade of the thirteenth century and died in 1360 (Bliss and Sharpe 1986, 686-8).	*c*1290-1360
Thorley, Isle of Wight	1416-17	bear names of John, rector of the church (recorded 1272, moved to Arreton 1285) and Wallerandus Trenchard (living 1260)(Colchester 1920, 116).	*c* 1260-85
Peterborough Cathedral	2374	bears name of John de Caleto, Abbot of the community (1249-62) (North 1878, 362-8; Gunton 1686, 34-5).	1249-62
Somerby, Lincolnshire	2203-4	donated by Thomas Cumberworth (died 1450); 2204 is dated 1431 (North 1882, 651-3).	before 1450; 1431
Wichenford, Worcestershire	3975	bell was cast in the time of Thomas Feld, vicar until 1489 (Walters 1932, 323-4).	before 1489
Woolwich, Kent	4778	donated by William Prene, rector (died 1404)(RCHM 1930, 101).	before 1404
Capel, Suffolk	3144	bears injunction to pray for the welfare of Gregory Pascall, who died in 1541 (Raven 1890, 174).	before 1541
St John Micklegate, York	4117-8	bells bears the names of Beatrix de Roos (died 1414) and Thomas de Walleworth (died 1409, but bell dated 1408)(RCHM 1972; 18, xlix).	before 1414 before 1409
Dorchester, Oxfordshire	2555	bears name of Ralph Rostwold, died 18 June 1383 (Cocks 1897, 50; Sharpe 1953, 117-21).	before 1383
Urswick, Lancashire	1829	bears names of William Harrington, Lord of Aldingham (died 1458), and Lady Margaret, his wife (Cheetham 1922-3; 77-8, 104-5, 137-42; 1928, 92-4).	before 1458
Crostwright, Norfolk	4428	John Aslak was godfather to the bell; he died in 1434 (L'Estrange 1874, 83).	before 1434
Mautby, Norfolk	4558	bears name of Robert Bataly, whose will was proven in 1494 (L'Estrange 1874, 162-3).	before 1494
Gloucester, St Nicholas	1219	donated by John Pytte (died 1558) and Alice his wife (Bliss and Sharpe 1986, 343-7).	before 1558
Bolton-by-Boland, Yorkshire (West Riding)	4140-1	bear injunctions to pray for the souls of John Pudsey and Grace his wife, and Henry Pudsey and Margaret his wife; Sir John Pudsey married Grace, daughter of Lawrence Hamerton, in 1464, his son Henry (died 1509) married Margaret, daughter of Sir John Conyers (died 1500)(Poppleton 1903, 198).	after 1464; after 1509
Hathersage, Derbyshire	0433	bears injunction to pray for the souls of Robert Eyre (living 1433) and Johanna his wife (died 1463)(Jewitt 1873b, 105-6).	after 1463
Soberton, Hampshire	1405-6	bear injunctions to pray for the souls of John Newport and Elizabeth his wife (died 1527)(Page 1908, 267).	after 1527

Table 6: clusters containing the documented bells formed by single-link cluster analysis of units at partitions at a similarity of between 0.1 and 1

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
T Lawrence	1	1	1, 8	1, 36, 45	75	108	121	-	-	-
John Danyell	1	1	1	1	1–2	1	1, 9	8	-	-
W Chamberlyn	1	1	1	1	1–5	1, 2, 10	1, 3, 10–12	9–12	1–4	1–4
T Bullisden	1	1	1	1	1–6	1, 11	5	-	-	-
R Chamberlyn	1	1	1	1	2	3, 4	13–14	13–14	-	-
Dawe/ Founder	1	1	1	1, 14	4–5	6, 8, 9	22–5, 27	20–21	7	7
Culverden	1	1	1	2	8	13, 14	29–30	24–5	8	8
Kebyll	1	1	1	3, 7	9, 11, 15, 21	16, 18, 23	31–2, 34, 38	26–7, 29	-	-
Johanna Sturdy	1	1	1	3, 6	9, 12, 20	15, 20, 32–3	-	-	-	-
John Sturdy	1	1	1	3, 6	9, 10, 20	22, 32	-	-	-	-
Richard Hille	1	1	1	3, 6	9, 20	21, 32	37	28	9	9
Johanna Hille	1	1	1	3	14	25	-	-	-	-
Roger Landen	1	1	1	4, 14, 27	16, 36	26, 57, 89	40, 42	30	-	-
W Hazelwood	1	1	1	4, 13	16, 28–29	44	60	40	15	15
John Saunders	1	1	1	4, 27	17	29, 89	-	-	-	-
White/Saunders	1	1	1	-	-	-	-	-	-	-
T Newcombe II	1	1	1	9	23	-	-	-	-	-
John Tonne	1	1	1	11–12	25–27	39–43	56–9	38–9	14	14
Thomas Derby	1	1	1	14	30	45	61	41	-	-
William Rufforde	1	1	1	14	30	45	-	-	-	-
Robert Clerke	1	1	1	14	30, 34	47, 49, 55	66	-	-	-
John Barber	1	1	1	14	31	53	-	-	-	-
'R'	1	1	1	14	31	-	-	-	-	-
Thomas Bett	1	1	1, 11	14, 50	35, 80	56, 113	124	84	38	38
Thomas Harrys	1	1	1, 2	14, 25, 36	56, 65	87, 96	108	77	32	32
Thomas Potter	1	1	1	14	39	60	81, 83	58	-	-
Austen Bracker	1	1	1	14	38	59	-	-	-	-
John Baly	1	1	1	14	39	60	78	54	-	-
Richard Baxter	1	1	1	14	39	60	83	59	-	-
Richard Brasyer	1	1	1	14	39	60	83	-	-	-
Thomas Gefferies	1	1	1	15	41, 44	65, 67, 70	87, 92	61, 64	23	23
Robert Norton	1	1	1	15, 18–19	41, 47, 48	65, 75, 77	87, 96	61, 68	25	25
'rt'	1	1	1	15	41	65	87–8	62	22	22
Henry Gefferies	1	1	1	15	41	65	87	-	-	-
William Warwick	1	1	1	15	41	66	-	-	-	-
'it'	1	1	1	17	46	74	-	-	-	-
R Hendley	1	1	1	18	47	76	94	66	24	24
R Heathcote I	1	1	1	26	57	-	-	-	-	-
G Heathcote	1	1	1	26	57	88	109	-	-	-
G & R Heathcote	1	1	1, 3	26, 37	57, 67	88	-	-	-	-
R Heathcote II	1	1	1	26	57	88	110	-	-	-
R Sempson	1	1	1	30	59	91	-	-	-	-
John Potter	1	1	1	34	62	94	115	79	33	33
William Revel	1	1	4	38	68	100	-	-	-	-
R de Wimbis	1	1	4	40	70	102	-	-	-	-
William Schep	1	1	4	40	70	102	-	-	-	-
John de York	1	1	11	49	79	112	-	-	-	-
Thomas de Wald	1	1	12	51	82	116	-	-	-	-
John de Colsale	1	3	19	57	88	123	134	93	-	-
John de Kirkham	-	-	-	-	-	-	-	-	-	-
John de Copgrave	-	-	-	-	-	-	-	-	-	-
Bristol	1	1	1	15	41, 45	63, 71–3	93	65	-	-
Bury St Edmunds	1	1	1	8	22	34–36	48–51	35–6	12	12
Chertsey	1	1	1	4, 28	16–17, 58	26, 28–9	40	31	-	-
Norwich	1	1	1	14, 33	37–40, 61	60–1, 93	75–84, 114	48–60	20–1	20–1

Table 7: clusters containing the documented trademarks and foundry marks formed by single-link cluster analysis at partitions at a similarity of between 0.1 and 1

Stamp	Founder	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
3.0001	William Chamberlyn, London (*c* 1440-74)	1	1	1	1	1	1	1	1	-	-
3.0002	William Chamberlyn, London (*c* 1440-74)	1	1	1	1	1	1	1	1	-	-
3.0004	Richard Chamberlyn, London (1474-1510)	1	2	2	2	2	-	-	-	-	-
3.0012	T Bullisden, London (c 1508-13)	1	-	-	-	-	-	-	-	-	-
3.0017	Thomas Lawrence, London (1522-45)	1	3	3	-	-	-	-	-	-	-
3.0022	Thomas Lawrence, London (1522-45)	1	3	4	-	-	-	-	-	-	-
3.0018	Roger Landen, Wokingham (*c* 1448-59)	1	4	-	-	-	-	-	-	-	-
3.0021	Roger Landen, Wokingham (c 1448-59)	1	4	-	-	-	-	-	-	-	-
3.0014	William Dawe or William Woodward, London (1393-5 or 1385-1421)	1	7	13	10	-	-	-	-	-	-
3.0086	unknown	1	7	14	-	-	-	-	-	-	-
3.0010	Johanna Sturdy, London (1454-60)	1	7	-	-	-	-	-	-	-	-
3.0009	Richard Hille, London (1416-40)	1	7	18	11	10	-	-	-	-	-
3.0007	John Kebyll, London (*c* 1480)	1	8	-	-	-	-	-	-	-	-
3.0015	William Culverden, London (*c* 1497-1522)	1	9	21	-	-	-	-	-	-	-
3.0008	Johanna Hille, London (1440-1)	1	-	-	-	-	-	-	-	-	-
3.0031	Robert Norton, Exeter (1423-33)	1	24	-	-	-	-	-	-	-	-
7.0016	unknown, ?London	1									
3.0013	unknown, ?London	1	27	-	-	-	-	-	-	-	-
3.0095	unknown	1	34	43	30	-	-	-	-	-	-
3.0030	"it", Exeter	1	38	-	-	-	-	-	-	-	-
3.0044	Robert Clerke, Lincoln (1483-1502)	1	54	-	-	-	-	-	-	-	-
3.0085	unknown	1	55	59	-	-	-	-	-	-	-
3.0011	T Bullisden, London (*c* 1508-13)	-	-	-	-	-	-	-	-	-	-
3.0065	Ralph Heathcote II, Chesterfield (1502-25)	6	69	76	-	-	-	-	-	-	-
3.0036	George Heathcote, Chesterfield (1525-58)	6	69	77	-	-	-	-	-	-	-
3.0078	Thomas Bett, Leicester (1521-39)	6	69	80	60	58	-	-	-	-	-
3.0025	Ralph Heathcote I, Chesterfield (*c* 1483-1502)	6	70	-	-	-	-	-	-	-	-
3.0028	Ralph Heathcote II & George Heathcote, Chesterfield (*c* 1525)	6	-	-	-	-	-	-	-	-	-
3.0093	A Brayser, Norwich (1377-1513)	8									
3.0092	A Brayser, Norwich (1377-1513)	8									
3.0091	A Brayser, Norwich (1377-1513)	8									
7.0019	Thomas Potter, Norwich (1404-28)	8	72	-	-	-	-	-	-	-	-
7.0095	John Bery, Norwich (1479-1503)	8	-	-	-	-	-	-	-	-	-
3.0019	Chertsey	1									
7.0075	Bristol	1	47	53	-	-	-	-	-	-	-
7.0074	Bristol	1	48	54	37	34	-	-	-	-	-
7.0076	Bristol	1	48	54	-	-	-	-	-	-	-
3.0090	Bury St Edmunds	1	58	64	-	-	-	-	-	-	-
3.0089	Bury St Edmunds	1	-	-	-	-	-	-	-	-	-
3.0094	Norwich	8	72	-	-	-	-	-	-	-	-

Table 8: estimated overall error and proportion of bells/stamps allocated to clusters for the selected partitions relating to founders and foundries of the single-link cluster analysis of units and types

	Similarity level	Estimated overall error	No of clusters	Proportion of bells/stamps allocated to clusters
Single-link cluster analysis of units (founders)	0.5	29.0%	89	85.7%
Single-link cluster analysis of units (foundries)	0.4	23.7%	58	94.7%
Single-link cluster analysis of types (founders)	0.2	24.0%	77	84.0%
Single-link cluster analysis of types (foundries)	0.1	44.3%	12	95.0%

Table 9: cluster membership of bells by known founders and/or foundries in solutions of the kmns cluster analysis (for selected numbers of clusters)

Bell	Founder	Foundry	Number of clusters																	
			10	14	20	30	40	50	58	60	70	80	89	90	100	110	120	130	140	150
0001	Thomas Lawrence	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	97	102	105
0002	William Culverden	London	1	1	1	7	17	45	51	51	60	62	64	64	68	71	73	73	75	76
0003	William Culverden	London	1	1	1	7	7	8	57	58	67	76	83	84	89	100	112	117	128	134
0007	John Danyell	London	10	13	16	25	29	33	36	57	66	75	38	38	38	39	41	41	41	41
0009	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
0012	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	32	32	32	32
0025	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
0028	T Bullisden	London	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0032	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
0034	Richard Hille	London	1	1	1	7	17	45	51	51	60	62	64	64	68	71	73	73	75	76
0042	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
0066		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
0077		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
0093	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	76	79	79	83	84
0095	Roger Landen	Wokingham	1	1	1	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
0097		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
0099	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
0104	John Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	13	93	97	98	103	107
0117	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
0118	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
0120	William Hazelwood	Wokingham	1	1	1	1	1	15	17	17	17	17	17	17	17	17	17	17	17	17
0124	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	107	111	121	126
0133	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
0135	John White & John Saunders	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0142	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
0147	William Hazelwood	Wokingham	1	1	1	12	12	15	17	17	17	17	17	17	99	17	30	30	30	30
0149	Roger Landen	Wokingham	1	1	1	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
0157	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	107	111	121	126
0161	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
0174	William Dawe/Woodward	London	1	1	18	21	24	28	30	30	30	30	30	30	30	30	31	31	31	31

0182	Johanna Sturdy	London	1	1	1	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13
0189	Richard Hille	London	1	1	1	1	1	1	1	1	58	59	60	60	61	63	65	65	65	66
0201	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
0211	John Danyell	London	10	13	19	24	27	31	34	57	66	75	82	83	88	99	104	107	117	122
0214	John Danyell	London	10	13	19	24	27	31	34	34	35	35	36	36	36	37	38	38	38	38
0222	John de Yorke		1	1	1	1	1	1	1	1	42	42	43	43	43	44	46	46	46	46
0228		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
0230	Thomas Derby	King's Lynn	5	6	8	26	31	36	40	40	44	44	45	45	45	46	48	48	48	48
0231		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
0233		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
0235	John Kebyll	London	3	11	13	16	16	19	21	21	21	21	21	21	21	21	21	21	21	21
0247	Austen Bracker		1	1	1	1	1	1	1	1	1	66	69	69	74	79	82	82	86	89
0250	John Kebyll	London	3	3	5	5	5	5	16	16	16	16	16	16	16	16	16	16	16	16
0254		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	120	128	139	147
0256		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
0258	William Culverden	London	1	1	1	1	1	1	57	58	67	76	83	84	89	100	112	117	128	134
0259		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
0267	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
0270		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
0277	Thomas Lawrence	London	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0280	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	33	34	34	34	34
0281		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
0282	John Kebyll	London	1	1	1	5	5	5	5	5	5	5	31	31	31	31	107	111	121	126
0283	Robert Clerke	Lincoln	1	1	1	1	39	48	54	54	62	68	73	73	78	86	89	89	93	96
0304	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
0317	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0318	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0319	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
0321	T Bullisden	London	1	1	16	1	28	32	35	35	36	36	37	37	37	38	40	97	102	105
0322	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
0327	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0360	John de Kirkham	York	1	1	1	1	1	1	1	1	1	1	70	70	75	81	84	84	88	91
0415	Ralph I Heathcote	Chesterfield	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0416	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49

0417	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	63	65	67	67	67	68
0454		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
0455		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
0457	Robert Clerke	Lincoln	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0461	Ralph II Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49
0462	George and Ralph II Heathcote	Chesterfield	1	1	1	1	32	49	56	56	65	71	77	77	82	91	94	94	99	102
0463	Thomas Newcombe II	Leicester	1	1	1	1	1	1	1	1	1	1	71	71	76	82	85	85	89	92
0480	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
0485	Thomas Gefferies	Bristol	1	1	1	23	37	46	52	52	59	61	63	63	66	69	71	71	71	72
0497	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
0505	William Dawe/Woodward	London	1	1	18	23	37	46	52	52	59	61	63	63	66	98	103	106	116	121
0506	William Dawe/Woodward	London	1	1	18	23	37	46	52	52	60	62	64	64	68	98	103	106	116	121
0518	Robert Norton	Exeter	1	1	1	1	1	40	45	45	49	49	50	50	50	52	54	54	54	54
0520	Roger Sempson	Aish Priors	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0521	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0522	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0530	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0553	Robert Norton	Exeter	1	1	1	1	1	40	45	45	49	49	50	50	50	52	54	54	54	54
0567	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0570	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0584	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0600	"rt"	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	19	19	19	19	19
0605	Thomas Gefferies	Bristol	1	1	1	23	37	46	52	52	59	61	63	63	66	69	71	71	71	72
0616	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0618	Robert Norton	Exeter	1	1	1	1	1	40	45	45	49	49	50	50	50	52	54	54	54	54
0633	Johanna Hille	London	1	1	1	7	17	45	51	51	60	62	64	64	68	71	73	73	75	76
0634	Johanna Hille	London	3	3	5	7	17	45	51	51	60	72	79	79	84	94	99	102	112	116
0656	Robert Norton	Exeter	1	1	1	1	1	40	45	45	49	49	50	50	50	52	54	54	54	54
0662	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0685		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
0709	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0725	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0737	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0742		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	146

0755	Robert Norton	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0764		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43	
0769	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15	
0780	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	32	32	32	32	
0810		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10	
0843	John Sturdy	London	3	11	13	11	11	12	13	13	13	13	13	13	98	93	97	98	104	108	
0858	William Culverden	London	1	1	1	1	7	8	57	58	67	76	83	84	89	100	105	109	119	124	
0877		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24	
0881		Wokingham	1	1	1	1	1	35	38	38	39	64	66	66	70	73	75	75	78	79	
0887	Thomas Gefferies	Bristol	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
0956	T Bullisden	London	1	1	16	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40	
0957	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	60	62	64	64	68	98	103	106	116	121	
0958		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	82	87	97	102	105	115	120	
0963		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144	
0967	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15	
0968	William Culverden	London	1	1	1	7	7	8	57	58	67	76	83	84	89	100	112	117	128	134	
0969	John Tonne	London	1	1	1	1	1	1	1	1	1	1	1	1	1	33	34	34	34	34	
0974	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	33	34	34	34	34	
0982	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33	
0984	William Dawe/Woodward	London	2	1	18	22	25	29	31	31	60	62	64	64	68	98	103	106	116	121	
0987	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	62	64	66	66	66	67	
0988	John Kebyll	London	1	1	1	5	5	5	5	5	5	5	31	31	31	31	1	1	1	1	
0989	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
0993	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
0994	Richard Hille	London	3	1	1	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13	
1000	John Danyell	London	10	13	19	24	27	31	34	57	66	75	82	83	88	99	104	107	117	122	
1004	T Bullisden	London	10	13	16	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40	
1005	Thomas Lawrence	London	1	1	1	1	1	1	42	42	46	46	47	47	47	49	51	51	51	51	
1008	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33	
1009	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	62	64	66	66	66	67	
1012	William Culverden	London	1	1	16	7	7	8	57	58	67	76	83	84	89	100	112	117	128	134	
1020	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	107	111	121	126	
1021	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
1022		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56	

1023	John Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	13	13	13	121	132	138
1025	T Bullisden	London	1	1	2	27	28	32	48	48	52	52	53	53	53	55	57	57	57	57
1031		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	120	128	139	147
1037		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
1038		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	56	58	60	60	60	60
1039	John Danyell	London	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1040	John Sturdy	London	3	3	5	7	17	20	22	22	22	22	22	22	22	22	22	22	22	22
1046	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	33	34	34	34	34
1047	Thomas Harrys	London	1	1	17	20	23	27	29	29	29	29	29	29	29	29	29	29	29	29
1052	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	107	111	121	126
1055	Thomas Lawrence	London	1	1	1	1	1	1	42	42	46	46	47	47	47	49	51	51	51	51
1056	Johanna Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	13	13	13	121	132	138
1058	Johanna Sturdy	London	3	3	5	11	17	20	22	22	33	33	34	34	34	34	35	35	35	35
1064	Johanna Sturdy	London	3	3	5	5	5	20	22	22	22	22	22	22	22	22	22	22	22	22
1076	John Tonne	London	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1078	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
1079	John Tonne	London	1	1	1	1	1	1	1	1	1	1	1	1	1	33	34	34	34	34
1086	John Sturdy	London	3	3	5	11	11	20	22	22	22	22	22	22	22	22	22	22	22	22
1090	Thomas Lawrence	London	1	1	1	1	1	1	1	1	1	1	1	1	98	48	50	130	50	50
1098	T Bullisden	London	1	1	2	27	33	38	48	48	52	52	53	53	53	55	57	57	57	57
1102	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
1110		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	56	58	60	60	60	60
1126	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	33	34	34	34	34
1129	Richard de Wimbis & William Revel	London	1	1	1	1	1	1	1	1	1	1	68	68	73	77	80	80	84	87
1132	William Culverden	London	1	1	1	7	7	8	57	58	67	76	83	84	89	100	112	117	128	134
1133		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	102	105	115	120
1136	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
1139	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
1147	T Bullisden	London	10	13	19	25	28	32	48	48	52	52	53	53	53	55	57	57	57	57
1151	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	107	111	121	126
1153		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	61
1157	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
1158	Johanna Sturdy	London	3	3	5	7	17	20	22	22	22	22	22	22	22	22	22	22	22	22
1176	Thomas Gefferies	Bristol	1	1	1	1	1	1	1	1	1	60	61	61	64	66	68	68	68	69

1180		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
1181	"rt"	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	19	19	19	19	19
1182	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	61	66	68	68	68	69
1193	Robert Hendley		1	1	1	28	34	39	44	44	48	48	49	49	49	51	53	53	53	53
1216	John Sturdy	London	1	1	1	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13
1248	Henry Gefferies	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	19	19	19	19	19
1257		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	36	37	37	77	78
1258		Bristol	1	1	1	1	1	1	1	1	1	1	1	1	10	1	1	1	10	10
1277	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
1286		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	74
1288	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
1295		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	74
1300		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	108	112
1301		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	108	112
1319	John Saunders	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1331	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1338	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	57	63	65	65	69	72	74	74	76	77
1343	William Hazelwood	Wokingham	1	1	1	1	1	15	17	17	17	17	17	17	17	17	17	17	17	17
1348	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1352	William Hazelwood	Wokingham	1	1	1	1	1	15	17	17	17	17	17	17	17	17	17	17	17	17
1358	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
1385	William Hazelwood	Wokingham	1	1	1	1	1	1	1	1	1	57	58	58	58	60	62	62	62	63
1401		Wokingham	4	4	6	6	6	6	6	6	6	57	58	58	58	60	62	62	62	63
1410	Johanna Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	100	101	106	110	120	125
1413		Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1420		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	59	61	63	63	63	106
1431	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	76	79	79	83	84
1433	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	76	79	79	83	84
1436	John Danyell	London	7	8	10	13	30	34	37	37	38	38	39	39	39	48	50	50	105	109
1437	Johanna Sturdy	London	3	3	5	7	17	45	22	22	22	22	22	22	100	101	106	110	120	125
1440		Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1443	William Hazelwood	Wokingham	1	1	1	1	1	15	17	17	17	17	17	17	17	17	17	17	17	17
1445		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
1506	William Warwick		1	1	1	23	37	46	52	52	59	61	63	63	66	69	71	71	71	72

1595	T Bullisden	London	10	13	16	25	28	32	35	35	36	36	37	37	37	38	40	97	102	105
1597	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
1607	William Dawe/Woodward	London	2	2	18	27	25	29	43	43	31	31	32	32	32	32	119	127	138	145
1608	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	57	63	65	65	69	72	74	74	76	117
1611	William Culverden	London	1	1	1	1	7	8	57	58	67	76	83	84	89	100	105	109	119	124
1614	William Rufford	Toddington	1	1	1	26	31	36	40	40	44	44	45	45	45	46	48	48	48	48
1615	T Bullisden	London	10	13	16	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40
1616	John Saunders	Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	59	61	63	63	63	106
1629	John Kebyll	London	3	3	5	5	5	20	16	16	16	16	16	16	16	16	16	16	16	16
1651	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
1661	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	32	32	32	32
1662	William Chamberlyn	London	7	8	2	2	40	7	7	7	7	7	7	7	7	7	7	7	109	113
1665	Richard de Wimbis	London	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1684	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
1688	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
1691	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	62	62	65	68	70	70	70	71
1694	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
1695	William Dawe/Woodward	London	1	1	18	22	25	29	31	31	31	31	32	32	32	98	103	106	116	121
1712	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
1735	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
1744	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
1759	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1760	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1766	Richard Chamberlyn	London	10	13	16	25	29	33	36	27	27	27	62	62	65	68	70	70	70	71
1771	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1796	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
1822	Robert Clerke	Lincoln	1	1	1	1	39	48	54	54	62	68	73	73	78	86	89	89	93	96
1831	William Dawe/Woodward	London	1	1	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
1837	Roger Landen	Wokingham	1	1	1	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
1858	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
1861	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
1934	John de Yorke		1	1	1	1	1	1	1	1	42	42	43	43	43	44	46	46	46	46
1959	Thomas Bett	Leicester	1	1	1	1	1	1	1	1	1	1	1	1	63	103	109	113	123	128
1962	Robert Clerke	Lincoln	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

1970	Robert Clerke	Lincoln	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1981	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	65	67	67	67	68
1987	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	63	65	67	67	67	68
2000	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	85	95	100	103	113	118
2020	Robert Clerke	Lincoln	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2030	Robert Clerke	Lincoln	1	1	1	1	39	48	54	54	62	68	73	73	78	86	89	89	93	96
2050	Robert Clerke	Lincoln	1	1	1	21	24	28	30	30	30	30	75	75	80	89	92	92	96	99
2111	John Potter	York	1	1	1	1	1	1	1	1	1	1	86	87	94	107	115	120	131	137
2141	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	32	32	32	32
2145	T Bullisden	London	10	13	19	24	28	32	35	34	35	35	36	36	36	67	69	97	102	105
2242	John Sturdy	London	3	1	1	7	17	45	51	51	60	72	79	79	84	94	99	102	112	116
2244	Robert Clerke	Lincoln	1	1	1	21	24	28	30	30	30	30	75	75	80	89	92	92	96	99
2251	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
2253	John Danyell	London	10	13	19	24	27	31	34	34	35	35	36	36	36	37	38	38	38	38
2281	Robert Clerke	Lincoln	1	1	1	21	24	28	30	30	30	30	75	75	80	89	92	92	96	99
2294	William Culverden	London	1	1	1	7	7	8	57	58	67	76	83	84	89	100	105	109	119	124
2301	Thomas Harrys	London	1	1	1	1	1	1	1	1	40	40	41	41	41	42	44	44	44	44
2305	T Bullisden	London	1	1	1	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40
2312	Richard Chamberlyn	London	2	2	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	148
2313		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
2322	Thomas Harrys	London	1	1	17	20	23	27	29	29	29	29	29	29	29	29	29	29	29	29
2359	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
2368		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
2371	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2373	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
2376	Thomas Harrys	London	1	1	17	20	23	27	29	29	29	29	29	29	29	29	29	29	29	29
2396	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
2431	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	2	2	2	2	2	98	103	106	116	121
2471	William Dawe/Woodward	London	1	1	18	1	32	49	56	56	65	71	77	77	82	98	103	106	116	121
2484	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	63	65	67	67	67	68
2493	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	63	65	67	67	67	68
2519	Robert Clerke	Lincoln	1	1	1	1	39	48	54	54	62	68	73	73	78	86	89	89	93	96
2523	Thomas Bett	Leicester	1	1	1	1	1	1	1	1	1	1	1	1	63	103	109	113	123	128
2537	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

2548	William Hazelwood	Wokingham	1	1	1	1	1	15	17	17	17	17	17	17	17	17	17	17	17	17
2556	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
2567	Roger Landen	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1	1	1	79	79	83	85
2569	John Sturdy	London	3	3	5	7	7	8	22	22	22	22	22	22	22	22	22	22	22	22
2586	William Dawe/Woodward	London	2	2	18	22	25	2	2	2	2	2	78	78	83	92	96	125	136	142
2587	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
2609	"R"		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2612	John Saunders	Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	59	61	63	63	63	64
2613	Roger Landen	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1	59	61	63	63	63	64
2683	Roger Landen	Wokingham	1	1	1	1	1	1	55	55	64	70	76	76	81	90	93	93	97	100
2702	Richard Chamberlyn	London	1	1	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
2734	Henry Gefferies	Bristol	1	1	1	23	37	46	52	52	59	61	63	63	66	69	71	71	71	72
2735		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2747	Roger Landen	Wokingham	4	4	6	1	1	1	1	1	57	63	65	65	69	72	74	74	76	77
2765		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2767	"rt"	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	19	19	19	19	19
2792	Henry Gefferies	Bristol	1	1	1	1	1	1	1	1	1	1	1	1	1	83	86	86	90	93
2798	Roger Sempson	Aish Priors	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2806		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2814	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
2842		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2843		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2845	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
2847	Robert Norton	Exeter	1	1	1	1	1	40	45	45	49	49	50	50	50	52	54	54	54	54
2849	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
2875	William Dawe/Woodward	London	1	1	18	1	1	29	1	1	1	1	1	1	1	98	103	106	116	121
2876	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
2882		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2887	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69
2889		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	74
2892		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10
2910	Thomas Gefferies	Bristol	1	1	1	23	37	46	52	52	59	61	63	63	66	69	71	71	71	72
2912		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	146
2924	"it"	Exeter	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

2941	Thomas Gefferies	Bristol	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2955	Thomas Gefferies	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69	
2980		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	74	
3000	"rt"	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	36	37	37	37	37	
3014		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	67	70	72	72	73	74	
3022	Robert Norton	Exeter	8	10	12	15	15	17	19	19	19	60	61	61	64	66	68	68	68	69	
3033	Thomas Bett	Leicester	1	1	17	20	23	27	29	29	29	29	29	29	29	103	109	113	123	128	
3052	William Chamberlyn	London	1	1	10	1	1	1	1	1	1	73	80	80	1	1	100	103	1	1	
3058	William Culverden	London	3	3	5	7	7	8	57	58	67	76	83	84	89	100	105	109	119	124	
3059	William Culverden	London	3	3	5	7	7	8	57	58	67	76	83	84	89	100	105	109	119	124	
3063	Robert Clerke	Lincoln	1	1	1	1	39	48	54	54	62	68	73	73	78	86	89	89	93	96	
3064	John de Colsale		1	1	1	1	1	1	1	1	41	41	42	42	42	43	45	45	45	45	
3084	Thomas Derby	King's Lynn	1	1	1	26	31	36	40	40	44	44	45	45	45	46	48	48	48	48	
3092		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25	
3097		Norwich	9	12	14	17	18	21	23	23	68	78	87	88	95	108	116	123	134	140	
3098		Norwich	6	7	15	18	19	22	24	24	68	78	87	88	95	108	116	123	134	140	
3102		Bury St Edmunds	1	1	1	1	1	1	1	47	55	55	56	82	87	97	102	105	115	120	
3103		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	56	58	60	60	60	60	
3107	John Danyell	London	1	1	1	1	30	34	37	37	38	38	39	39	39	48	50	50	105	109	
3108		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25	
3109	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15	
3110	Thomas Potter	Norwich	9	12	14	17	18	44	50	50	56	56	57	57	57	59	98	101	111	115	
3111	John Kebyll	London	3	3	5	5	5	5	5	5	58	59	31	31	31	31	107	111	121	126	
3112		Bury St Edmunds	1	1	1	1	1	1	1	60	70	80	89	90	97	110	118	126	137	144	
3114		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25	
3115		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	79	88	91	91	95	98	
3147		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56	
3148		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144	
3156		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	61	61	62	
3157		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	61	108	118	123	
3158		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23	
3159		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23	
3162		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25	
3164		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56	

3169		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
3174		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3175		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3176	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3181		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
3183		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
3196		Norwich	1	1	1	1	1	23	25	25	25	74	81	81	86	96	101	104	114	119
3197		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3212		Norwich	9	12	15	18	19	21	23	23	68	78	87	88	95	108	116	23	23	23
3213		Norwich	6	7	15	18	19	21	23	23	68	78	87	88	95	108	116	23	23	23
3214	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3221	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	31	31	31	31	32	32	32	32
3231		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3237	Richard Hille	London	1	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3242		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
3248		Norwich	6	7	15	18	19	21	23	23	68	78	87	88	95	108	116	123	134	140
3251		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3262		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
3263	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3265		Norwich	6	7	15	18	19	22	24	24	24	25	25	25	25	25	25	25	25	25
3266		Norwich	6	7	15	18	19	23	25	25	25	74	81	81	86	96	101	104	114	119
3267	Johanna Hille	London	1	11	13	16	16	18	20	20	20	20	20	20	62	64	66	66	66	67
3288		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3289	John Kebyll	London	3	3	5	5	5	5	9	9	9	9	9	9	9	9	9	9	9	9
3291		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	102	105	115	120
3299		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
3301	Thomas Potter	Norwich	9	12	14	17	18	44	50	50	56	56	57	57	57	59	61	61	61	62
3302		Norwich	9	12	14	17	18	21	23	23	68	78	87	88	95	108	116	123	134	140
3303		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3312		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3318		Bury St Edmunds	1	14	20	30	36	42	47	60	70	80	89	90	97	110	118	126	137	144
3320	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	60	62	64	64	68	98	103	106	116	121
3321	John Sturdy	London	3	3	5	7	7	20	22	22	22	22	22	22	22	22	22	22	22	22
3322	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33

3331		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
3344	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3347		Norwich	6	7	15	18	19	1	1	1	68	78	87	88	95	108	116	123	134	140
3360	John Kebyll	London	3	3	5	5	5	5	16	16	16	16	16	16	16	16	16	16	16	16
3363		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	56	58	60	60	60	60
3369	Thomas Potter	Norwich	9	12	14	17	18	44	50	50	56	56	57	57	57	59	61	61	61	62
3371	Thomas Potter	Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
3379	William Dawe/Woodward	London	2	2	18	22	25	2	2	2	2	2	78	78	83	92	96	125	136	142
3390		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	120	128	139	147
3391		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	102	105	115	120
3401		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
3404	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3415	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3416	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3417	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3423		Bury St Edmunds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	120	128	139	147
3424		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	82	87	97	120	128	139	147
3431	William Dawe/Woodward	London	2	2	18	27	17	29	51	51	60	62	64	64	68	98	103	106	140	149
3432		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
3433		Norwich	6	7	15	18	19	23	25	25	68	78	87	88	95	108	116	123	134	140
3434	Thomas Lawrence	London	1	1	1	1	1	1	42	42	46	46	47	47	47	49	51	51	51	51
3435	Richard Hille	London	1	11	13	16	16	18	20	20	20	20	20	20	62	64	66	66	66	67
3436	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3442		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	82	97	120	128	139	147
3453		Bury St Edmunds	1	14	20	30	36	42	47	47	55	55	56	56	56	58	60	60	60	60
3457	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	80	95	100	103	124	129
3472	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	57	63	65	65	65	14	14	14	14	14
3475	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3477	Roger Landen	Wokingham	4	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3479	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	20	20	20	20	20
3481	Thomas Harrys	London	1	1	1	1	1	1	1	1	40	40	41	41	41	42	44	44	44	44
3490	Johanna Sturdy	London	1	1	1	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13
3517	John Tonne	London	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3518	John Tonne	London	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

3526	John Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	13	93	97	98	103	107
3531	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	80	95	100	103	124	129
3532	Richard Hille	London	3	11	13	16	16	18	20	20	20	20	20	20	20	64	66	66	66	67
3540	Roger Landen	Wokingham	4	4	6	12	12	13	14	14	14	14	14	14	14	14	14	14	14	14
3542	T Bullisden	London	10	13	19	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40
3543	T Bullisden	London	10	13	16	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40
3545	Richard Hille	London	3	3	5	11	11	12	13	13	13	13	13	13	13	93	97	98	103	107
3546	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3547	T Bullisden	London	1	1	16	25	28	32	35	35	36	36	37	37	37	38	40	40	40	40
3552	John Saunders	Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	61	63	63	63	106
3553	John Tonne	London	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3557	William Dawe/Woodward	London	2	2	2	27	33	38	43	43	47	47	48	48	48	50	52	52	52	52
3562	John Sturdy	London	3	3	5	11	11	20	22	22	22	22	22	22	22	22	22	22	22	22
3565	Thomas Harrys	London	1	1	1	1	1	1	1	1	40	40	41	41	41	42	44	44	44	44
3567	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3569	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3576	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	87	90	90	94	97
3578	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	80	95	100	103	113	118
3585	William Dawe/Woodward	London	2	2	18	22	25	2	2	2	2	2	78	78	78	92	96	125	136	142
3596	Johanna Sturdy	London	3	3	5	11	11	20	22	22	13	72	79	79	79	13	13	13	13	13
3597	John Tonne	London	1	1	3	3	3	3	32	32	32	32	33	33	33	87	90	90	94	97
3610	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3611	John Tonne	London	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3612	John Tonne	London	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3652	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3675	Johanna Sturdy	London	3	3	5	11	11	12	13	13	13	13	13	13	13	13	13	13	13	13
3679	Thomas Harrys	London	5	6	8	9	9	10	11	11	11	11	11	11	11	84	87	87	91	94
3686	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	15	15	15	15	15	15	15	15	15
3714	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
3716	"rt"	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	19	19	19	19	19
3750	T Bullisden	London	1	1	1	1	28	32	35	35	36	36	37	37	37	38	40	40	40	40
3751		Wokingham	1	1	1	1	1	35	38	38	39	39	40	40	40	41	43	43	43	43
3765	"rt"	Bristol	8	10	12	15	15	17	19	19	19	60	61	61	61	66	68	68	68	69
3775		Bristol	1	5	7	8	8	9	10	10	10	10	10	10	10	10	10	10	10	10

3779	John Barber	Salisbury	1	1	17	20	23	27	29	29	29	29	29	29	29	29	29	29	29	29
3798	Thomas Gefferies	Bristol	1	1	1	23	37	46	52	52	59	61	63	63	63	69	71	71	71	72
3803	Thomas Gefferies	Bristol	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3806	John Kebyll	London	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3827	William Chamberlyn	London	7	8	10	13	13	14	15	15	15	73	80	80	80	95	100	103	113	118
3868	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
3881	Henry Gefferies	Bristol	8	10	12	15	15	17	19	19	19	19	19	19	19	36	37	37	37	37
3886	Henry Gefferies	Bristol	1	1	17	23	37	46	52	52	59	61	63	63	63	69	71	71	71	143
3902	Richard Chamberlyn	London	10	13	16	19	21	25	27	27	27	27	27	27	27	27	27	27	27	27
4012	Thomas de Wald	York	1	1	1	1	1	1	1	1	1	1	1	1	1	80	83	83	87	90
4113	John Potter	York	1	1	1	1	1	1	1	1	1	1	71	71	71	82	85	85	89	92
4142	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	65	67	67	67	68
4143	George Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	65	67	67	67	68
4172	Ralph I Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49
4193	George and Ralph II Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49
4205	William Chamberlyn	London	10	13	19	24	27	31	34	34	35	35	36	36	36	37	38	38	38	38
4206	William Chamberlyn	London	10	13	19	24	27	31	34	34	35	35	36	36	36	37	38	38	38	38
4208	Ralph II Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49
4238	Robert Clerke	Lincoln	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4324	John de Copgrave		1	1	1	1	1	1	1	1	1	1	70	70	70	81	84	84	88	91
4359		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4360		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4363		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23
4364		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4365		Norwich	6	7	15	18	19	11	12	12	63	69	74	74	74	88	91	123	134	140
4368		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4376		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4379		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4400		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4405		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4407		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23
4412	Thomas Derby	King's Lynn	5	6	8	9	9	10	11	11	11	11	11	11	11	11	11	11	11	11
4413		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4417		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12

4418		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4422		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
4426	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	125	136	142
4427		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
4432	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	33	33	33
4443		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4450	Thomas Potter	Norwich	1	1	1	26	31	36	40	40	56	56	57	57	57	59	48	48	48	48
4451		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23
4457	Thomas Potter	Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4458		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
4463		Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23
4468		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4470		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4471		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4472	Richard Baxter	Norwich	9	12	14	17	18	44	50	50	23	23	23	23	23	23	23	61	61	62
4475	William Shep	London	1	1	1	1	1	1	1	1	1	1	68	68	68	77	80	80	84	87
4484		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4487	Thomas Potter	Norwich	9	12	14	17	18	44	50	50	56	56	57	57	57	59	61	61	61	62
4488		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
4494		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4499		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4512		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4518		Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4519		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	61	108	118	123
4532	Richard Baxter	Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	108	118	123
4536		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4541		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4548		Norwich	1	1	1	1	1	1	1	1	1	66	69	69	69	79	82	82	86	89
4566		Norwich	6	7	9	10	10	11	12	12	12	12	12	12	12	12	12	12	12	12
4567		Norwich	1	1	1	1	1	23	25	25	25	74	81	81	81	96	101	104	114	119
4573	John Baly	Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	23	23	23
4574	John Baly	Norwich	6	7	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4575		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4576		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56

4578		Norwich	1	1	1	1	22	26	28	28	28	66	69	69	69	79	82	82	86	89
4582		Norwich	6	7	15	18	19	22	24	24	24	24	24	24	24	24	24	24	24	24
4583		Norwich	1	1	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4584	Thomas Potter	Norwich	1	1	9	10	10	11	12	12	63	69	74	74	74	88	91	91	95	98
4590		Norwich	9	12	14	17	18	21	23	23	68	78	87	87	88	108	116	123	134	140
4591		Norwich	6	7	15	18	19	23	25	25	25	25	25	25	25	25	25	25	25	25
4593		Norwich	1	1	1	1	1	23	25	25	25	74	81	81	81	96	101	104	114	119
4617	Thomas Potter	Norwich	9	12	14	17	18	44	50	50	56	56	57	57	57	59	61	61	61	62
4624		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
4630	Thomas Potter	Norwich	1	1	1	26	31	36	40	40	44	44	45	45	45	46	48	48	48	48
4636	Richard Brasyer I or II	Norwich	9	12	14	17	18	21	23	23	23	23	23	23	23	23	23	108	118	123
4684		Bury St Edmunds	1	14	20	30	36	42	47	47	51	51	52	52	52	54	56	56	56	56
4703	William Dawe/Woodward	London	2	2	18	22	25	29	31	31	31	31	32	32	32	32	33	125	136	142
4711		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4717		Norwich	9	12	9	10	10	21	23	23	63	69	74	74	74	88	91	91	95	98
4729	Thomas Potter	Norwich	9	12	14	26	31	36	40	40	56	56	57	57	57	59	61	61	61	62
4730	Johanna Sturdy	London	3	3	5	7	17	20	22	22	33	33	34	34	34	34	35	35	35	35
4742		Norwich	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4766	Ralph II Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49
4789	Ralph II Heathcote	Chesterfield	1	1	1	1	32	37	41	41	45	45	46	46	46	47	49	49	49	49

Table 10: cluster membership of stamps by known foundries in solution of the k-means cluster analysis (only trademarks are assigned to founders; see Table 11)

Stamp	Foundry	10	12	20	30	40	50	60	70	77	80	90	100
1.0001	London	3	3	3	3	34	34	34	34	34	34	34	34
1.0005	London	7	8	15	18	40	47	52	58	61	62	63	63
1.0007	London	4	4	4	13	13	13	13	13	13	13	13	13
1.0010	London	1	1	1	1	1	1	42	52	57	58	58	71
1.0013	unknown	1	1	17	29	22	22	22	22	22	22	22	22
1.0014	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
1.0029	London	1	1	1	21	24	24	1	52	57	58	58	58
1.0033	unknown	8	10	11	11	32	32	32	32	32	32	32	32
1.0035	London	1	1	16	19	19	19	54	60	63	64	65	65
1.0036	London	4	7	7	21	29	29	29	29	29	29	29	29
1.0037	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0041	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0065	unknown	1	1	1	14	14	14	14	14	49	49	49	49
1.0079	Norwich	1	1	1	1	1	1	1	1	1	1	1	1
1.0081	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0084	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0089	London	4	7	7	21	24	49	42	42	42	42	42	42
1.0090	Salisbury	1	1	1	14	14	14	14	14	49	49	49	94
1.0102	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0103	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0106	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
1.0127	London	1	1	20	25	33	33	33	33	33	33	33	33
1.0128	York	1	1	1	1	1	1	1	1	1	1	1	1
1.0136	London	1	1	20	25	33	33	33	33	33	33	33	33
1.0158	Bristol	1	1	1	1	21	21	21	69	76	77	82	84
1.0161	Leicester	1	1	1	1	1	1	1	1	1	1	1	1
1.0163	Bristol	6	6	6	6	6	6	6	6	6	6	6	6
1.0188	York	1	1	1	1	1	1	1	1	1	1	1	1
1.0194	Norwich	1	1	19	24	31	46	50	53	55	55	55	55
1.0212	Norwich	10	12	13	15	15	15	15	15	15	15	15	15
1.0244	unknown	1	1	1	27	20	20	20	20	20	20	72	73
1.0251	London	1	1	20	25	33	33	33	33	33	33	33	33
1.0267	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0284	London	1	1	1	1	1	1	1	1	1	1	1	1
1.0287	unknown	1	1	1	1	1	1	1	1	1	1	1	1
1.0289	Norwich	1	1	1	1	1	1	1	67	73	74	79	81
2.0002	London	1	1	1	1	30	30	30	30	30	30	30	30
2.0006	Wokingham	1	1	1	1	1	1	49	50	52	52	52	52
2.0007	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
2.0015	York	1	1	1	1	1	1	1	1	1	1	1	1
2.0016	unknown	1	1	1	1	1	1	1	1	1	1	1	1
2.0046	London	1	1	20	25	33	33	33	33	33	33	33	33
2.0050	Leicester	1	1	1	1	1	1	1	1	1	1	1	1
2.0073	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
2.0077	unknown	1	1	1	1	1	1	55	61	65	66	67	67
2.0078	Bristol	6	6	6	6	6	6	6	6	6	6	6	6
2.0080	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
2.0081	York	1	1	1	1	1	1	1	1	1	1	1	1
2.0086	London	1	1	20	25	33	33	33	33	33	33	33	33
2.0102	London	1	1	1	1	1	1	1	1	1	1	1	1
2.0106	unknown	1	1	1	14	14	14	14	14	49	49	49	49
2.0107	London	1	7	7	21	24	24	51	54	56	57	57	57
2.0115	King's Lynn	1	1	1	1	1	1	1	1	1	1	1	89
2.0138	London	1	1	1	1	1	1	1	1	1	1	1	1

2.0146	London	1	1	1	1	1	1	1	1	1	1	1	1
2.0160	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0001	London	3	3	3	3	3	3	3	3	3	3	3	3
3.0002	London	3	3	3	3	3	3	3	3	3	3	3	3
3.0004	London	1	1	16	19	19	19	19	19	19	19	19	19
3.0005	London	7	8	8	8	8	8	8	8	8	8	8	8
3.0006	London	1	1	1	30	38	39	45	46	46	46	46	46
3.0007	London	4	7	7	7	7	43	44	45	45	45	45	45
3.0008	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0009	London	1	1	14	17	17	17	17	17	17	17	17	17
3.0010	London	4	7	7	21	24	24	42	52	57	58	58	58
3.0011	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0012	London	1	1	16	19	19	42	43	57	60	61	61	61
3.0014	London	4	4	4	4	4	4	4	4	4	4	4	4
3.0015	London	1	1	1	1	1	1	1	68	75	76	81	83
3.0017	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0018	Wokingham	1	1	18	22	26	26	26	26	26	26	26	26
3.0019	Wokingham	1	1	1	1	1	1	49	50	52	52	52	52
3.0021	Wokingham	1	1	1	1	1	1	1	1	1	1	90	100
3.0022	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0025	Chesterfield	1	1	1	1	1	1	1	1	1	1	1	1
3.0028	Chesterfield	1	1	1	1	1	1	1	1	1	1	1	1
3.0030	Exeter	1	1	1	1	1	1	1	1	72	73	78	80
3.0031	Exeter	1	1	1	1	1	50	46	47	72	73	89	96
3.0036	Chesterfield	1	1	1	1	1	45	48	49	50	50	50	50
3.0044	Lincoln	1	1	1	1	37	38	38	38	38	38	38	85
3.0065	Chesterfield	1	1	1	1	1	1	1	1	1	1	1	1
3.0071	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0072	London	1	1	1	1	1	1	1	1	1	1	1	1
3.0078	Leicester	1	1	1	1	1	1	1	1	1	1	1	1
3.0082	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
3.0089	Bury St Edmunds	1	1	1	1	1	1	1	1	1	1	1	1
3.0090	Bury St Edmunds	1	1	10	10	10	10	10	55	58	59	59	59
3.0091	Norwich	2	2	19	24	31	31	31	31	31	31	31	31
3.0092	Norwich	10	12	13	15	25	25	25	44	44	44	44	44
3.0093	Norwich	2	2	2	2	35	36	36	36	36	36	36	36
3.0094	Norwich	1	1	1	1	1	1	1	67	73	74	79	81
4.0013	unknown	1	1	17	20	28	28	28	28	28	28	28	28
4.0015	unknown	6	6	6	6	21	40	40	40	40	40	40	40
5.0002	unknown	1	1	1	1	1	1	49	50	52	52	52	52
5.0003	Wokingham	1	1	1	1	1	1	49	50	52	52	52	52
5.0010	London	1	1	1	30	38	39	39	39	39	39	39	39
5.0023	Norwich	10	12	19	24	25	25	25	25	25	25	25	25
5.0024	unknown	1	1	1	1	21	40	40	40	40	40	83	86
5.0028	London	4	7	7	21	39	44	51	54	56	56	56	56
5.0031	London	1	1	1	1	1	1	1	1	1	1	1	1
5.0033	London	1	1	1	1	1	1	1	1	1	1	1	1
5.0035	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
5.0053	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
5.0055	London	1	1	20	25	33	33	33	33	33	33	33	33
5.0056	London	1	1	1	1	1	1	1	1	1	1	1	1
5.0080	Norwich	1	1	1	1	1	1	1	67	73	74	79	81
5.0089	London	1	1	1	1	1	1	1	1	1	1	1	1
6.0002	London	1	1	1	1	1	1	1	1	1	1	1	1
6.0013	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
6.0019	unknown	1	1	1	1	1	1	1	1	1	1	1	1
7.0001	unknown	1	1	1	16	16	16	16	16	16	16	16	16
7.0002	unknown	1	1	1	16	16	16	16	16	16	16	16	16

7.0003	unknown	8	10	11	11	11	11	11	11	11	11	11	11
7.0004	unknown	8	10	11	11	11	11	11	11	11	11	11	11
7.0009	Wokingham	1	1	18	22	26	26	26	26	26	26	90	100
7.0012	Norwich	2	2	2	2	2	2	2	2	2	2	2	2
7.0013	Norwich	10	12	13	15	15	15	15	15	15	78	85	91
7.0016	London	7	8	8	8	8	8	8	8	8	8	8	8
7.0017	London	1	1	20	25	33	33	33	33	33	33	33	33
7.0018	London	1	1	20	25	33	33	33	33	33	33	33	33
7.0019	Norwich	1	1	1	1	1	1	1	67	73	74	79	81
7.0020	unknown	5	5	5	5	5	5	5	64	68	69	70	70
7.0029	London	1	1	20	25	33	33	33	33	33	33	33	33
7.0042	York	1	1	1	1	1	1	1	1	1	1	1	1
7.0057	London	1	1	1	1	1	1	1	1	1	1	1	1
7.0062	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
7.0074	Bristol	1	1	17	20	28	28	28	28	28	28	28	28
7.0075	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
7.0076	Bristol	1	1	17	20	28	28	28	28	28	28	28	88
7.0093	London	1	1	1	1	1	1	1	1	1	1	1	1
7.0095	Norwich	1	1	1	1	1	1	1	1	1	1	1	1
8.0001	London	9	11	12	23	23	42	43	43	43	43	43	43
8.0002	London	4	7	7	21	24	24	51	54	56	56	56	56
8.0004	unknown	4	7	7	7	7	7	7	7	7	7	7	7
8.0005	Wokingham	5	5	18	22	26	26	26	51	53	53	53	53
8.0008	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
8.0021	unknown	1	1	1	14	14	14	14	14	14	14	14	14
8.0034	London	1	1	1	30	38	39	39	39	39	39	76	77
8.0035	London	1	1	1	1	1	1	1	1	1	1	1	1
8.0045	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
8.0046	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
8.0051	London	7	7	7	21	24	24	24	24	24	24	24	24
8.0052	unknown	8	10	11	11	32	32	32	32	32	32	32	32
8.0055	London	1	7	15	17	40	46	47	48	48	48	87	93
8.0056	London	7	8	15	18	18	18	18	18	18	18	18	18
8.0088	unknown	1	1	1	14	14	14	14	14	74	75	80	82
8.0108	unknown	1	1	1	1	1	1	1	1	1	1	1	1
8.0113	London	4	4	4	4	4	4	53	59	62	63	64	64
8.0124	Wokingham	1	1	1	1	1	1	1	1	1	1	1	1
8.0154	Norwich	10	12	13	15	15	15	15	15	15	15	15	15
8.0155	London	1	1	1	1	1	1	1	1	1	1	1	1
8.0172	Leicester	1	1	1	1	1	1	1	1	1	1	1	1
8.0177	York	1	1	1	1	1	1	1	1	1	1	1	1
8.0216	London	1	1	1	1	1	1	1	1	1	1	1	1
8.0225	Bristol	1	1	1	1	1	1	1	1	1	1	62	62
8.0242	London	1	1	1	1	1	1	1	1	1	1	1	1
8.0245	Norwich	10	12	19	24	31	46	50	53	55	55	55	98
8.0247	Norwich	1	1	1	1	1	1	1	1	1	1	1	1

Table 11: cluster membership of the documented trademarks and foundry marks in solutions of the k-means cluster analysis

Stamp	Founder	10	12	20	30	40	50	60	70	77	80	90	100
3.0001	William Chamberlyn, London (*c* 1440-74)	3	3	3	3	3	3	3	3	3	3	3	3
3.0002	William Chamberlyn, London (*c* 1440-74)	3	3	3	3	3	3	3	3	3	3	3	3
3.0004	Richard Chamberlyn, London (1474-1510)	1	1	16	19	19	19	19	19	19	19	19	19
3.0007	John Kebyll, London (*c* 1480)	4	7	7	7	7	43	44	45	45	45	45	45
3.0008	Johanna Hille, London (1440-1)	1	1	1	1	1	1	1	1	1	1	1	1
3.0009	Richard Hille, London (1416-40)	1	1	14	17	17	17	17	17	17	17	17	17
3.0010	Johanna Sturdy, London (1454-60)	4	7	7	21	24	24	42	52	57	58	58	58
3.0011	T Bullisden, London (c1508-13)	1	1	1	1	1	1	1	1	1	1	1	1
3.0012	T Bullisden, London (*c*1508-13)	1	1	16	19	19	42	43	57	60	61	61	61
3.0013	unknown, ?London	1	1	16	37	38	38	38	38	38	38	38	38
3.0014	William Dawe or William Woodward, London (1393-5 or 1385-1421)	4	4	4	4	4	4	4	4	4	4	4	4
3.0015	William Culverden, London (*c* 1497-1522)	1	1	1	1	1	1	1	68	75	76	81	83
3.0017	Thomas Lawrence, London (1522-45)	1	1	1	1	1	1	1	1	1	1	1	1
3.0018	Roger Landen, Wokingham (*c* 1448-59)	1	1	18	22	26	26	26	26	26	26	26	26
3.0019	Chertsey	1	1	1	1	1	1	49	50	52	52	52	52
3.0021	Roger Landen, Wokingham (*c* 1448-59)	1	1	1	1	1	1	1	1	1	1	90	100
3.0022	Thomas Lawrence, London (1522-45)	1	1	1	1	1	1	1	1	1	1	1	1
3.0025	Ralph Heathcote I, Chesterfield (*c* 1483-1502)	1	1	1	1	1	1	1	1	1	1	1	1
3.0028	Ralph Heathcote II & George Heathcote, Chesterfield (*c* 1525)	1	1	1	1	1	1	1	1	1	1	1	1
3.0030	"it", Exeter	1	1	1	1	1	1	1	1	72	73	78	80
3.0031	Robert Norton, Exeter (1423-33)	1	1	1	1	1	50	46	47	72	73	89	96
3.0036	George Heathcote, Chesterfield (1525-58)	1	1	1	1	1	45	48	49	50	50	50	50
3.0044	Robert Clerke, Lincoln (1483-1502)	1	1	1	1	37	38	38	38	38	38	38	85
3.0065	Ralph Heathcote II, Chesterfield (1502-25)	1	1	1	1	1	1	1	1	1	1	1	1
3.0078	Thomas Bett, Leicester (1521-39)	1	1	1	1	1	1	1	1	1	1	1	1
3.0085	unknown	1	1	1	16	37	38	38	38	38	38	38	38
3.0086	unknown	9	11	12	28	12	12	12	12	12	12	12	12
3.0089	Bury St Edmunds	1	1	1	1	1	1	1	1	1	1	1	1
3.0090	Bury St Edmunds	1	1	10	10	10	10	10	55	58	59	59	59
3.0091	A Brayser, Norwich (1377-1513)	2	2	19	24	31	31	31	31	31	31	31	31
3.0092	A Brayser, Norwich (1377-1513)	10	12	13	15	25	25	25	44	44	44	44	44
3.0093	A Brayser, Norwich (1377-1513)	2	2	2	2	35	36	36	36	36	36	36	36
3.0094	Norwich	1	1	1	1	1	1	1	67	73	74	79	81
3.0095	unknown	1	1	1	27	20	20	20	20	20	20	20	20
7.0016	unknown, ?London	7	8	8	8	8	8	8	8	8	8	8	8
7.0019	Thomas Potter, Norwich (1404-28)	1	1	1	1	1	1	1	67	73	74	79	81
7.0074	Bristol	1	1	17	20	28	28	28	28	28	28	28	28
7.0075	Bristol	1	1	1	1	1	1	1	1	1	1	1	1
7.0076	Bristol	1	1	17	20	28	28	28	28	28	28	28	88
7.0095	John Bery, Norwich (1479-1503)	1	1	1	1	1	1	1	1	1	1	1	1

Table 12: estimated overall error for the selected partitions relating to founders and foundries of the k-means cluster analysis of units and types

	Number of clusters	Estimated overall error
k-means cluster analysis of units (founders)	50	37.7%
k-means cluster analysis of units (foundries)	14	58.9%
k-means cluster analysis of types (founders)	10	27.6%
k-means cluster analysis of types (foundries)	10	55.6%

Table 13: number of clusters formed by shared near neighbour cluster analysis of units for different numbers of shared for partitions considered in detail in subsequent analysis)

level\k	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	\	\	89	47	28	19	15	10	7	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
2	\	\	\	85	47	20	20	14	9	8	6	5	4	4	4	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
3		\	\	\	\	59	44	34	23	16	11	10	7	6	6	4	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
4			\	\	\	\	81	50	39	25	20	15	14	11	8	7	7	6	5	5	4	4	4	4	4	3	3	2	3	3	3	3
5				\	\	\	\	\	64	47	30	21	18	17	13	10	10	10	8	8	6	6	5	5	5	4	4	4	4	4	4	3
6					\	\	\	\	\	76	47	30	23	20	18	14	11	11	10	8	7	7	7	6	6	5	5	5	5	5	4	4
7						\	\	\	\	\	90	58	36	27	21	18	14	12	12	10	7	7	7	7	6	5	5	5	5	5	5	5
8							\	\	\	\	\	\	71	47	39	25	21	19	15	12	10	7	7	7	7	5	5	5	5	5	5	5
9								\	\	\	\	\	\	86	56	43	28	21	18	14	11	10	7	7	7	6	5	5	5	5	5	5
10									\	\	\	\	\	\	94	63	51	36	24	17	13	11	10	8	8	7	7	6	5	5	5	5
11										\	\	\	\	\	\	97	74	55	44	31	22	16	13	11	9	8	8	7	6	6	6	6
12											\	\	\	\	\	\	\	87	67	50	38	28	20	16	14	11	10	8	7	6	6	6
13												\	\	\	\	\	\	\	92	78	59	45	38	24	18	15	11	11	11	9	8	7
14													\	\	\	\	\	\	\	94	82	70	54	40	30	22	16	12	12	12	10	8
15														\	\	\	\	\	\	\	\	81	70	54	46	30	23	18	14	13	13	11
16															\	\	\	\	\	\	\	\	88	73	61	50	33	24	19	15	13	13
17																\	\	\	\	\	\	\	\	93	79	66	51	36	27	21	17	14
18																	\	\	\	\	\	\	\	\	96	82	66	55	40	27	21	17
19																		\	\	\	\	\	\	\	\	\	86	71	58	44	30	23
20																			\	\	\	\	\	\	\	\	\	87	71	62	45	31
21																				\	\	\	\	\	\	\	\	\	92	70	66	48
22																					\	\	\	\	\	\	\	\	\	93	75	64
23																						\	\	\	\	\	\	\	\	\	96	77
24																							\	\	\	\	\	\	\	\	\	\
25																								\	\	\	\	\	\	\	\	\
26																									\	\	\	\	\	\	\	\
27																										\	\	\	\	\	\	\
28																											\	\	\	\	\	\
29																												\	\	\	\	\
30																													\	\	\	\
31																														\	\	\
32																															\	\
33																																\
34																																
35																																
36																																
37																																
38																																
39																																
40																																
41																																
42																																
43																																
44																																
45																																
46																																
47																																
48																																
49																																
50																																
51																																
52																																
53																																
54																																
55																																
56																																
57																																
58																																
59																																
60																																
61																																
62																																
63																																

Table 14: number of bells in residue formed by shared near neighbour cluster analysis of units for different numbers o
those for partitions considered in detail in subsequent analysis)

level\k	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1	\	\	123	81	49	32	17	8	5	3	3	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	\	\	\	119	76	49	30	21	14	9	7	7	6	3	3	3	3	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
3		\	\	\	\	75	44	29	20	14	11	9	7	5	4	4	3	3	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
4			\	\	\	\	92	60	41	26	19	15	12	9	7	5	4	4	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
5				\	\	\	\	\	79	45	35	27	17	15	11	10	8	8	6	5	3	3	2	1	1	0	0	0	0	0	0	0	0
6					\	\	\	\	\	84	53	45	34	23	17	14	12	10	9	7	5	5	4	3	3	3	3	3	3	2	2	2	2
7						\	\	\	\	\	114	70	54	37	29	25	16	14	11	10	9	7	6	4	3	3	3	3	3	3	3	3	3
8							\	\	\	\	\	\	92	63	44	32	22	17	15	12	10	10	7	6	5	4	4	4	4	3	3	3	3
9								\	\	\	\	\	\	106	74	55	38	30	24	18	16	14	13	9	8	5	5	4	4	4	4	3	3
10									\	\	\	\	\	\	135	94	67	44	35	25	20	18	16	12	10	8	8	5	5	5	4	4	4
11										\	\	\	\	\	\	160	114	85	53	38	26	20	18	15	14	10	10	8	7	6	6	5	5
12											\	\	\	\	\	\	\	128	97	66	48	31	24	20	18	16	12	12	8	8	6	6	5
13												\	\	\	\	\	\	\	144	106	71	55	33	27	21	18	16	14	10	8	8	7	6
14													\	\	\	\	\	\	\	163	120	80	64	41	29	21	19	16	14	11	10	8	8
15														\	\	\	\	\	\	\	\	138	87	66	47	34	24	20	17	15	14	10	9
16															\	\	\	\	\	\	\	\	142	97	75	51	38	26	23	18	16	14	11
17																\	\	\	\	\	\	\	\	150	108	83	58	41	30	28	21	15	15
18																	\	\	\	\	\	\	\	\	152	115	87	58	43	32	32	25	22
19																		\	\	\	\	\	\	\	\	\	120	90	64	47	39	31	26
20																			\	\	\	\	\	\	\	\	\	132	102	67	51	41	31
21																				\	\	\	\	\	\	\	\	\	144	113	70	57	43
22																					\	\	\	\	\	\	\	\	\	148	118	77	57
23																						\	\	\	\	\	\	\	\	\	154	126	84
24																							\	\	\	\	\	\	\	\	\	\	126
25																								\	\	\	\	\	\	\	\	\	\
26																									\	\	\	\	\	\	\	\	\
27																										\	\	\	\	\	\	\	\
28																											\	\	\	\	\	\	\
29																												\	\	\	\	\	\
30																													\	\	\	\	\
31																														\	\	\	\
32																															\	\	\
33																																\	\
34																																	\
35																																	
36																																	
37																																	
38																																	
39																																	
40																																	
41																																	
42																																	
43																																	
44																																	
45																																	
46																																	
47																																	
48																																	
49																																	
50																																	
51																																	
52																																	
53																																	
54																																	
55																																	
56																																	
57																																	
58																																	
59																																	
60																																	
61																																	
62																																	
63																																	

Table 15: percentage Type A error relating to documented founders of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (= more than 99 clusters)

k/level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	**0**	**0**	**0**	**0**	**0**	**0**	**0**	2.9	8.6	26	60	66	\	\
52	**0**	**0**	**0**	**0**	**0**	5.7	11	11	57	\	\	\		
42	**0**	**0**	**0**	2.9	5.7	14	60	71	\	\				
36	**0**	**0**	2.9	5.7	8.6	51	\	\	\					
32	**0**	**0**	2.9	8.6	23	74	\	\						
22	**0**	**0**	5.7	54	\									
12	**0**	2.9	\											
2	\													

Table 16: percentage Type A error relating to bells by documented founders of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k/level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.8	1.9	6.3	25	33	\	\
52	**0**	**0**	**0**	**0**	**0**	1.6	2.4	3	18	\	\	\		
42	**0**	**0**	**0**	0.8	1.3	3.3	16	26	\	\				
36	**0**	**0**	0.8	1.3	3	14	\	\	\					
32	**0**	**0**	0.8	1.9	4.4	26	\	\						
22	**0**	**0**	1.4	15	\									
12	**0**	0.8	\											
2	\													

Table 17: percentage Type B error relating to documented founders of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (= more than 99 clusters)

k\level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	100	100	100	100	100	100	100	100	98	98	92.2	**78**	\	\
52	100	100	100	100	100	98	98	96.1	94.1	\	\	\		
42	100	100	100	100	98	96	94	84	\	\				
36	100	100	100	100	92	94	\	\	\					
32	100	100	100	98	94	82	\	\						
22	100	100	98	82	\									
12	100	96	\											
2	\													

Table 18: percentage Type B error relating to bells by documented founders of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	89.8	89.8	89.8	89.8	89.8	89.8	89.8	86.8	85.4	78.4	44.2	26.4	\	\
52	89.8	89.8	89.8	89.8	89.8	85.7	84.9	83.9	50.1	\	\	\		
42	89.8	89.8	89.8	88.9	88.1	84	50.1	22.7	\	\				
36	89.8	89.8	88.9	88.4	87	48.2	\	\	\					
32	89.8	89.8	88.9	87.6	80.8	**19**	\	\						
22	89.8	89.8	88.6	26.6	\									
12	89.8	88.9	\											
2	\													

Table 19: percentage overall error relating to bells by documented founders of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	89.8	89.8	89.8	89.8	89.8	89.8	89.8	86.8	85.4	79.2	54.6	50.3	\	\
52	89.8	89.8	89.8	89.8	89.8	85.7	84.9	84.4	54.7	\	\	\		
42	89.8	89.8	89.8	88.9	88.1	84.5	52.1	35.1	\	\				
36	89.8	89.8	88.9	88.4	87	50.1	\	\	\					
32	89.8	89.8	88.9	87.6	81.4	34.4	\	\						
22	89.8	89.8	88.6	**31.7**	\									
12	89.8	88.9	\											
2	\													

Table 20: percentage Type A error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	**8.3**	**8.3**	**8.3**	**8.3**	**8.3**	**8.33**	**8.33**	16.7	16.7	50	58.3	75	\	\
64	**8.3**	**8.3**	**8.3**	**8.3**	**8.3**	16.7	16.7	25	66.7	\	\	\		
42	**8.3**	**8.3**	**8.3**	17	17	25	66.7	83.3	\	\				
36	**8.3**	**8.3**	17	17	25	66.7	\	\	\					
32	**8.3**	**8.3**	17	17	33	83.3	\	\						
22	**8.3**	**8.3**	17	83	\									
12	**8.3**	25	\											
2	\													

Table 21: percentage Type A error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k/level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**	2.51	3.5	9.8	39.7	49.9	\	\
52	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**	3.09	3.48	4.3	32.4	\	\	\		
42	**0.39**	**0.39**	**0.39**	0.97	1.35	4.66	34.5	50.3	\	\				
36	**0.39**	**0.39**	0.97	1.35	2.13	32.4	\	\	\					
32	**0.39**	**0.39**	0.97	1.56	4.31	53.5	\	\						
22	**0.39**	**0.39**	1.36	49	\									
12	**0.39**	1.36	\											
2	\													

Table 22: percentage Type B error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	100	100	100	100	100	100	100	100	100	100	100	**64**	\	\
52	100	100	100	100	100	100	100	100	100	\	\	\		
42	100	100	100	100	100	100	100	86	\	\				
36	100	100	100	100	100	100	\	\	\					
32	100	100	100	100	100	79	\	\						
22	100	100	100	93	\									
12	100	100	\											
2	\													

Table 23: percentage Type B error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k/level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.6	59.8	33.5	56.6	7.9	\	\
52	57.5	57.5	57.5	57.5	57.5	57.7	57.4	60.9	33	\	\	\		
42	57.5	57.5	57.5	58.1	58.5	57.5	19.6	51	\	\				
36	57.5	57.5	58.1	58.5	58.9	8.15	\	\	\					
32	57.5	57.5	58.1	58.7	50	**2.21**	\	\						
22	57.5	57.5	57.6	3.63	\									
12	57.5	57	\											
2	\													

Table 24: percentage overall error relating to bells by documented foundries of partitions formed by shared near neighbour cluster analysis of units for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k/level	1	3	8	13	18	23	28	31	36	41	46	51	56	61
63	57.5	57.5	57.5	57.5	57.5	57.5	57.5	59.8	62.7	38.4	56.6	53.3	\	\
52	57.5	57.5	57.5	57.5	57.5	57.7	60.5	61.1	49.3	\	\	\		
42	57.5	57.5	57.5	58.1	58.5	61.6	43.3	51	\	\				
36	57.5	57.5	58.1	58.5	58.9	**36.2**	\	\	\					
32	57.5	57.5	58.1	58.7	50.6	54	\	\						
22	57.5	57.5	58.5	50	\									
12	57.5	57.8	\											
2	\													

Table 25: number of clusters formed by shared near neighbour cluster analysis of types for different numbers of share for partitions considered in detail in subsequent analysis)

level\k	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
1	\	73	34	16	11	8	7	6	4	4	4	3	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	85	\	81	41	24	11	8	8	6	6	6	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3		71	\	82	51	36	22	13	10	8	8	7	6	6	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
4			47	88	81	65	45	36	16	13	11	9	8	6	6	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
5				40	77	83	76	58	45	22	14	11	9	8	6	6	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1	1
6					37	70	80	88	67	52	32	21	13	11	9	6	6	5	5	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1	1
7						35	59	77	87	73	58	36	25	15	11	10	7	6	5	5	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1	1
8							35	58	78	90	79	66	44	28	18	12	10	7	6	5	5	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
9								30	58	75	86	81	71	48	35	24	12	10	7	6	5	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
10									29	57	75	86	83	75	53	37	24	14	11	7	6	5	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2
11										28	54	71	85	80	76	55	38	23	13	11	7	6	4	4	3	3	3	3	3	3	3	3	2	2	2	2	2
12											29	55	69	88	79	73	55	39	24	17	14	8	7	5	5	4	3	3	3	3	3	3	3	2	2	2	2
13												27	53	69	90	83	75	56	41	27	17	15	8	7	5	5	4	3	3	3	3	3	3	3	2	2	2
14													27	52	70	89	79	75	59	42	26	17	15	8	7	6	5	4	3	3	3	3	3	3	3	3	2
15														27	54	68	86	78	73	57	43	30	20	15	8	7	6	6	4	3	3	3	3	3	3	3	3
16															27	52	67	85	76	74	55	42	27	19	15	9	7	6	5	4	3	3	3	3	3	3	3
17																27	52	67	82	75	72	56	42	29	18	15	10	9	7	6	4	3	3	3	3	3	3
18																	27	52	65	81	75	71	52	41	30	19	14	9	8	7	6	4	4	3	3	3	3
19																		28	52	64	81	73	69	54	42	29	21	14	9	8	7	6	4	4	3	3	3
20																			28	52	64	81	72	66	49	41	29	21	15	9	8	6	6	4	3	3	3
21																				28	52	64	82	73	66	49	40	29	20	17	10	8	7	7	4	3	3
22																					28	52	64	83	72	65	50	36	26	20	17	11	8	8	7	4	3
23																						28	52	65	83	72	65	47	36	25	18	15	11	8	8	8	4
24																							28	52	65	85	73	65	47	34	24	18	15	11	9	8	6
25																								28	52	65	85	73	65	47	34	23	16	14	11	10	8
26																									29	52	68	85	73	64	46	34	22	16	14	11	10
27																										29	52	69	85	72	64	47	32	21	16	15	11
28																											29	52	69	86	71	64	46	30	20	15	15
29																												29	52	69	85	72	65	44	30	19	16
30																													29	52	69	85	73	64	43	31	19
31																														29	52	70	85	72	63	42	29
32																															29	53	71	85	72	61	42
33																																29	54	71	85	72	61
34																																	29	54	72	85	72
35																																		29	54	72	85
36																																			29	54	72
37																																				29	54
38																																					29
39																																					
40																																					
41																																					
42																																					
43																																					
44																																					
45																																					
46																																					
47																																					
48																																					
49																																					
50																																					
51																																					
52																																					
53																																					
54																																					
55																																					
56																																					
57																																					
58																																					
59																																					
60																																					
61																																					
62																																					
63																																					

Table 26: number of bells in residue formed by shared near neighbour cluster analysis of types for different numbers o those for partitions considered in detail in subsequent analysis)

Level\k	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	\	39	20	11	6	5	4	4	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	295	\	51	27	19	12	11	9	6	3	6	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3		319	\	81	48	31	21	19	17	15	12	9	6	5	4	4	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
4			371	228	128	72	49	34	25	20	17	12	7	6	5	4	4	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0
5				394	278	178	96	66	46	34	26	20	13	10	9	8	6	6	2	2	2	2	2	2	2	2	2	2	0	0	0	0
6					407	302	224	132	86	62	45	29	19	13	11	10	8	7	6	2	2	2	2	2	2	2	2	2	2	0	0	0
7						408	328	239	150	104	74	53	39	24	16	13	10	9	7	6	2	2	2	2	2	2	2	2	2	2	0	0
8							412	335	249	158	114	81	61	48	31	20	12	10	8	7	6	2	2	2	2	2	2	2	2	2	2	0
9								415	344	267	185	125	88	65	50	34	22	14	10	8	7	6	2	2	2	2	2	2	2	2	2	2
10									417	345	273	198	139	99	72	53	36	24	14	10	8	7	6	2	2	2	2	2	2	2	2	2
11										421	353	288	215	154	107	77	60	42	26	15	9	8	7	6	2	2	2	2	2	2	2	2
12											419	351	299	218	161	120	88	67	47	29	15	10	9	7	6	2	2	2	2	2	2	2
13												422	357	299	218	158	123	88	69	50	29	20	12	10	9	8	2	2	2	2	2	2
14													422	359	295	220	169	128	88	71	52	33	20	12	10	8	7	2	2	2	2	2
15														423	356	300	227	176	132	97	76	53	34	23	15	13	9	8	3	2	2	2
16															423	360	304	232	183	137	101	81	57	37	24	16	13	9	8	4	2	2
17																423	359	303	283	187	143	100	80	57	37	25	18	15	12	10	4	3
18																	423	359	307	240	186	141	105	82	59	40	29	21	18	15	13	8
19																		421	359	310	240	190	144	106	84	63	43	30	23	18	16	13
20																			421	358	310	241	191	146	116	84	63	43	31	24	18	16
21																				421	358	310	239	188	147	115	87	66	47	32	24	21
22																					421	358	310	236	187	146	111	91	68	47	35	24
23																						421	358	307	235	186	145	115	91	70	49	38
24																							421	358	307	230	183	141	114	89	71	50
25																								421	358	307	226	182	140	114	86	73
26																									419	356	300	225	181	141	113	85
27																										419	356	298	225	181	139	109
28																											419	355	297	221	181	137
29																												419	355	297	221	177
30																													419	355	297	222
31																														419	355	297
32																															419	355
33																																419
34																																
35																																
36																																
37																																
38																																
39																																
40																																
41																																
42																																
43																																
44																																
45																																
46																																
47																																
48																																
49																																
50																																
51																																
52																																
53																																
54																																
55																																
56																																
57																																
58																																
59																																
60																																
61																																
62																																
63																																

Table 27: percentage overall error relating to documented founders of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	86.4	21.4
52	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	70	**10**		
42	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	92.9	88.9	88.9	60	11.1				
32	92.9	92.9	92.9	92.9	92.9	92.9	92.9	89.3	88.9	57.1	50	11.1	20						
22	92.9	92.9	92.9	92.9	92.9	45.5	36.8	16.7	25										
12	93.1	96.4	63	11.1	25														
2	\																		

Table 28: estimated errors relating to documented founders of partitions forming the maximum number of clusters for selected numbers of shared near neighbours (k) in the shared near neighbour cluster analysis of types

k	level	Type A error	Type B error	Overall error	Residue	Clusters
63	60	0%	21.4%	21.4%	197	78
52	49	0%	23%	23%	205	81
42	39	0%	18%	18%	214	84
32	29	0%	18%	18%	221	85
22	19	25%	10%	20%	240	81
12	9	16.7%	11%	**16.7%**	**185**	**86**

Table 29: percentage Type A error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12.9	50		
42	0	0	0	0	0	0	0	0	0	0	0	0	0	16.1	46.2				
32	0	0	0	0	0	0	0	3.03	0	16.1	17.9	41.7	25						
22	0	0	0	0	0	19.4	29.6	33.3	14.3										
12	0	0	18.2	40	11.1														
2	\																		

Table 30: percentage Type A error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3.05	19.6	59.4
52	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	3.1	24.5	55.3		
42	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	14.5	15.6	33.3	55.6				
32	**0**	**0**	**0**	**0**	**0**	**0**	**0**	12.2	16.7	36.2	41.7	52.4	57.6						
22	**0**	**0**	**0**	9.77	9.77	59.6	48	54.1	56.3										
12	11.9	14.8	42.9	59.6	57.1														
2 \																			

Table 31: percentage Type B error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	48.5	10
52	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	38.7	**0**		
42	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	64.7	64.7	25.8	**0**				
32	62.9	62.9	62.9	62.9	62.9	62.9	62.9	60	64.7	25.8	10.7	**0**	**0**						
22	62.9	62.9	62.9	64.7	64.7	22.6	7.41	**0**	**0**										
12	62.9	58.8	18.2	**0**	**0**														
2 \																			

Table 32: percentage Type B error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	38.4	4.35
52	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	49.6	32.1	**0**		
42	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	49.3	64.5	64.8	27.6	**0**				
32	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	50	27.6	8.33	**0**	**0**						
22	48.9	48.9	48.9	51.1	51.1	49.5	5.1	32.4	**0**										
12	46.7	41.4	21	**0**	**0**														
2 \																			

Table 33: percentage overall error relating to documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55
63	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	48.5
52	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	51.6	50	
42	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	64.7	64.7	41.9	46.2			
32	62.9	62.9	62.9	62.9	62.9	62.9	62.9	60	64.7	41.9	25	41.7	25					
22	62.9	62.9	62.9	64.7	64.7	38.7	33.3	33.3	14.3									
12	62.9	58.8	24.2	40	**11.1**													
2	\																	

Table 34: percentage overall error relating to stamps by documented foundries of partitions formed by shared near neighbour cluster analysis of types for different numbers of shared near neighbours (k) and different thresholds (level) (\ = more than 99 clusters)

k\level	1	5	6	10	11	15	16	20	21	25	26	30	31	35	40	45	50	55	60
63	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	50.4	**39.3**	60.9
52	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	51.2	55.7	55.3		
42	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	49.3	64.5	64.8	51.4	55.6				
32	48.9	48.9	48.9	48.9	48.9	48.9	48.9	51.9	64.3	50.5	45.8	52.4	57.6						
22	48.9	48.9	48.9	51.1	51.1	76.1	48.9	64.9	46.9										
12	59.3	53.1	47.1	59.6	57.1														
2	\																		

Table 35: estimated overall error for the selected partitions relating to founders and foundries of the shared near neighbour cluster analysis of units and types

	k	threshold	Number of clusters	Number in residue	Estimated overall error
shared near neighbour cluster analysis of units (founders)	22	13	59	71	31.7%
shared near neighbour cluster analysis of units (foundries)	36	23	37	50	36.2%
shared near neighbour cluster analysis of types (founders)	12	9	86	185	16.7%
shared near neighbour cluster analysis of types (foundries)	63	55	14	63	39%

Table 36: estimated overall error for the most accurate partitions relating to founders and foundries of the cluster analyses of units and types discussed in Chapter 3

	Number of clusters	Number in residue	Estimated overall error
Clusters of units (bells) relating to founders			
single-link cluster analysis (similarity=0.5)	89	184	**29.0%**
k-means cluster analysis	50	-	37.7%
shared near neighbour cluster analysis (k=22; threshold=13)	59	71	31.7%
Clusters of units (bells) relating to foundries			
single-link cluster analysis (similarity=0.4)	58	68	**23.7%**
k-means cluster analysis	14	-	58.9%
shared near neighbour cluster analysis (k=36; threshold=23)	37	50	36.2%
Clusters of types (stamps) relating to founders			
single-link cluster analysis (similarity=0.2)	77	81	24.0%
k-means cluster analysis	100	-	27.6%
shared near neighbour cluster analysis (k=12; threshold=9)	86	185	**16.7%**
Clusters of types (stamps) relating to foundries			
Single-link cluster analysis (similarity=0.1)	12	25	44.3%
k-means cluster analysis	10	-	55.6%
shared near neighbour cluster analysis (k=63; threshold=55)	14	63	**39%**

Table 37: estimated errors of the orderings produced by further analyses of the clusters of units shown as single nodes in Figure 87

Cluster	'Horseshoe' effect	ρ	Error (map)	Error ('seriation')
2	Yes (Fig 91)	0.50	0%	0%
3	Yes (Fig 93)	0.77	20%	20%
6d	Yes (Figs 104-5)	0.61	24%	33%
7a	Yes (Fig 108)	0.81	0%	0%
7b	No (Fig 109)	0.77	-	40%
9d	Yes (Fig 118)	0.79	0%	7%
10b	No (Fig 186)	0.79	-	0%
11b	No (Fig 198)	0.84	-	0%
11h	No (Fig 128)	0.82	-	0%
11i	No (Fig 129)	0.81	-	42%
11k	Yes (Fig 130)	0.82	17%	17%
19e	No (Fig 143)	0.89	-	15%

Table 38: estimated errors of the orderings produced by further analyses of the clusters of types shown as single nodes in Figure 159

Cluster	'Horseshoe' effect	ρ	Error (map)	Error ('seriation')
11b	No (Fig 204)	0.88	-	20%
16d	Yes (Fig 208)	0.88	0%	20%
16f	No (Figs 206)	0.83	-	20%

Table 39: estimated overall error for the most accurate partitions relating to founders and foundries of the cluster analyses of units and types discussed in Chapter 3, and the correspondence analyses discussed in Chapter 4

	Number of clusters	Number in residue	Estimated overall error
Clusters of units (bells) relating to founders			
single-link cluster analysis (similarity=0.5)	89	184	**29.0%**
k-means cluster analysis	50	-	37.7%
shared near neighbour cluster analysis (k=22; threshold=13)	59	71	31.7%
correspondence analysis (round 2)	68	37	32.1%
Clusters of units (bells) relating to foundries			
single-link cluster analysis (similarity=0.4)	58	68	23.7%
k-means cluster analysis	14	-	58.9%
shared near neighbour cluster analysis (k=36; threshold=23)	37	50	36.2%
correspondence analysis (round 1)	35	12	**8.1%**
Clusters of types (stamps) relating to founders			
single-link cluster analysis (similarity=0.2)	77	81	24.0%
k-means cluster analysis	100	-	27.6%
shared near neighbour cluster analysis (k=12; threshold=9)	86	185	**16.7%**
correspondence analysis (round 2)	53	24	57.7%
Clusters of types (stamps) relating to foundries			
single-link cluster analysis (similarity=0.1)	12	25	44.3%
k-means cluster analysis	10	-	55.6%
shared near neighbour cluster analysis (k=63; threshold=55)	14	63	39.0%
correspondence analysis (round 1)	29	24	**20.7%**

VALIDATING CLASSICAL MULTIVARIATE MODELS IN ARCHAEOLOGY

ENGLISH MEDIEVAL BELLFOUNDING AS A CASE STUDY

Alexandra Louise Bayliss
Institute of Archaeology, University College London,
31-4, Gordon Square, London, WC1H 0PY

Thesis submitted for PhD

VOLUME 2 (of 2)

Figure 1: map of recorded medieval bells from England (n=4797)

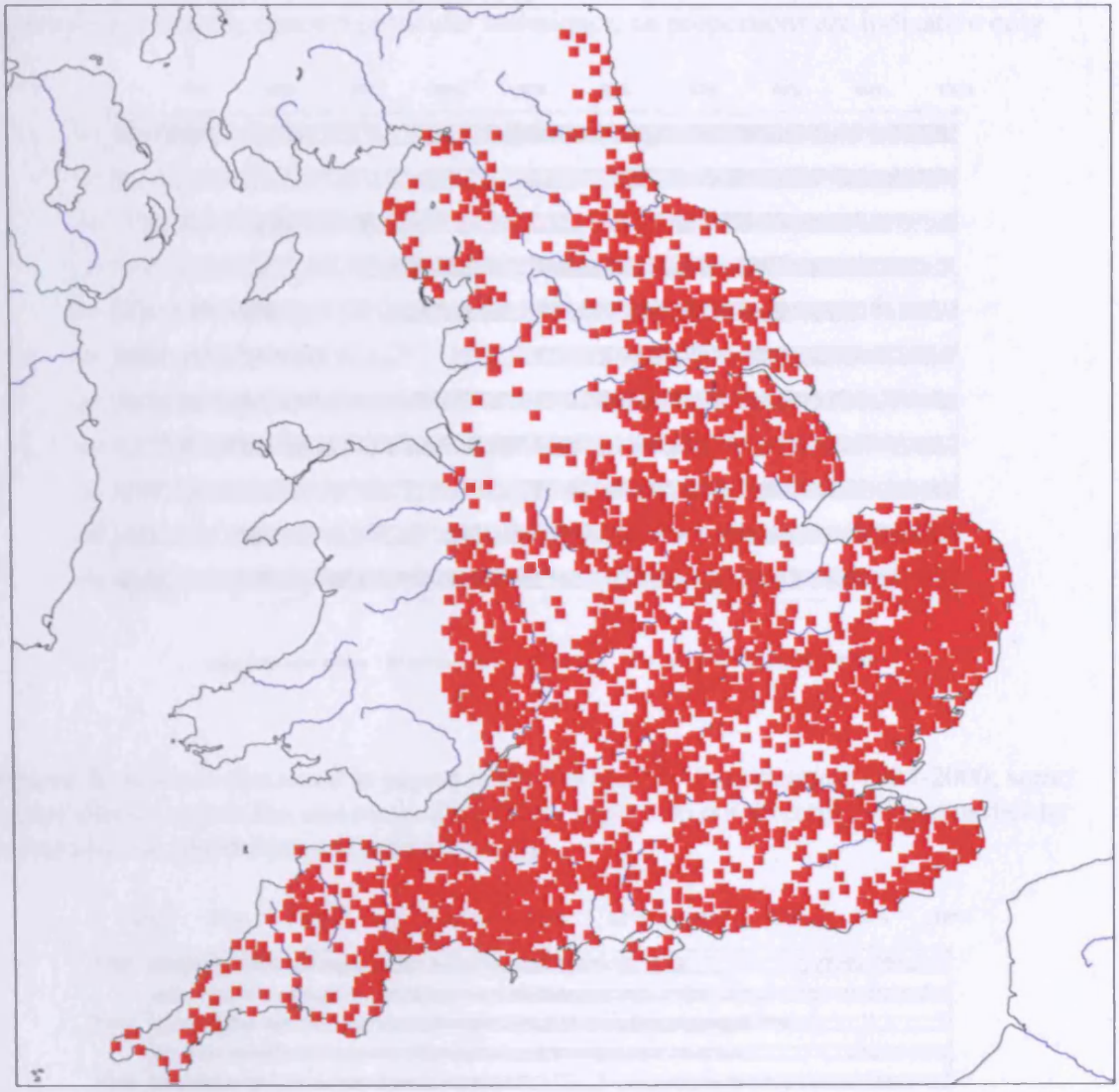


Figure 2: methods applied at *Computer Applications and Quantitative Methods in Archaeology* Conferences 1988-98; some papers discuss more than one method and other papers do not directly concern particular techniques, so proportions are indicative only

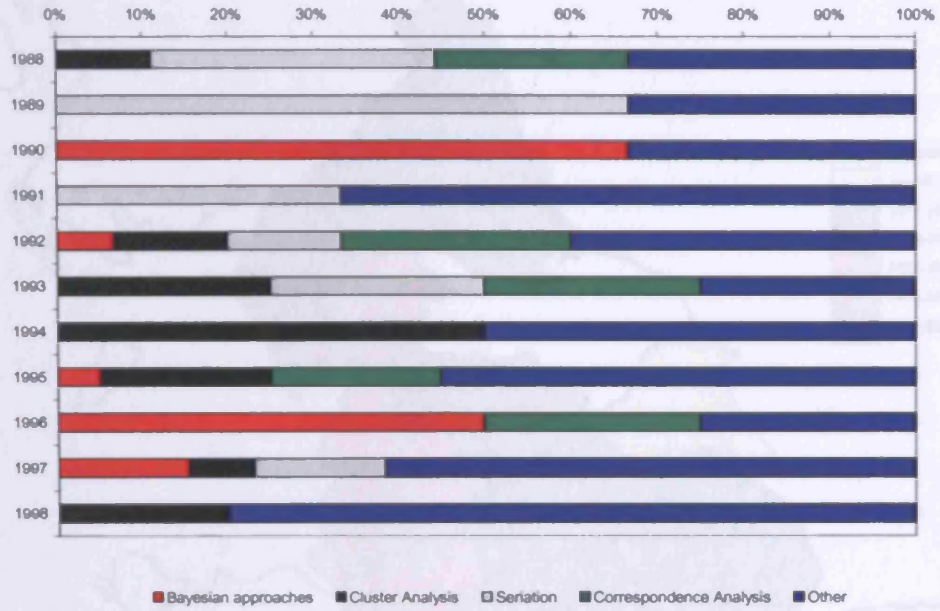


Figure 3: methods discussed in papers in the *Journal of Classification* 1984-2000; some papers discuss more than one method and other papers do not directly concern particular techniques, so proportions are indicative only

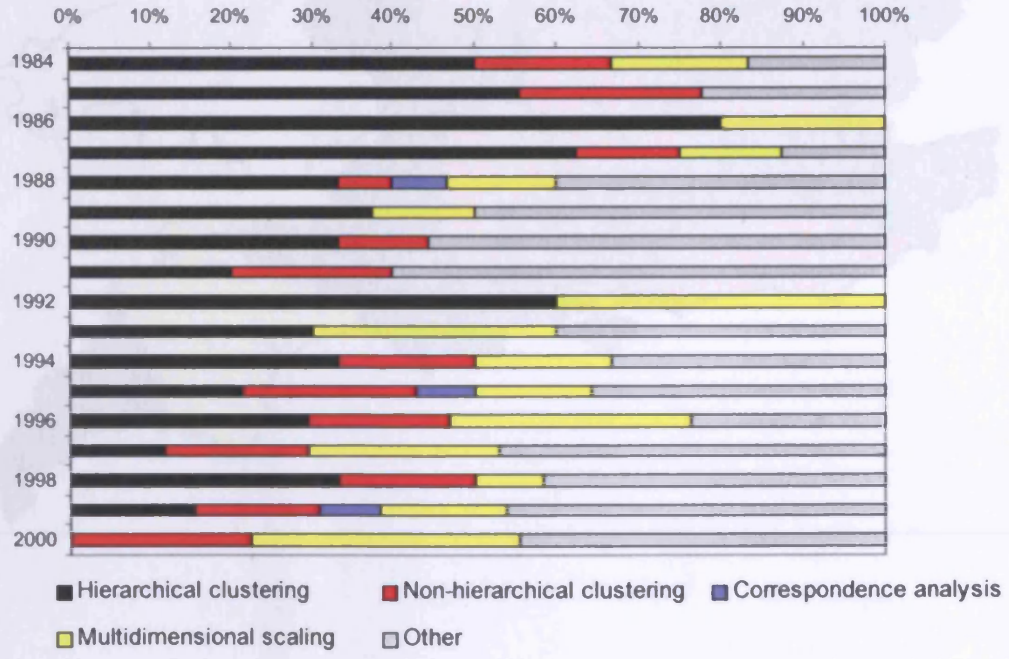


Figure 4: dates of publication of county histories of bells (where more than one comprehensive work is available, the most recent is plotted)

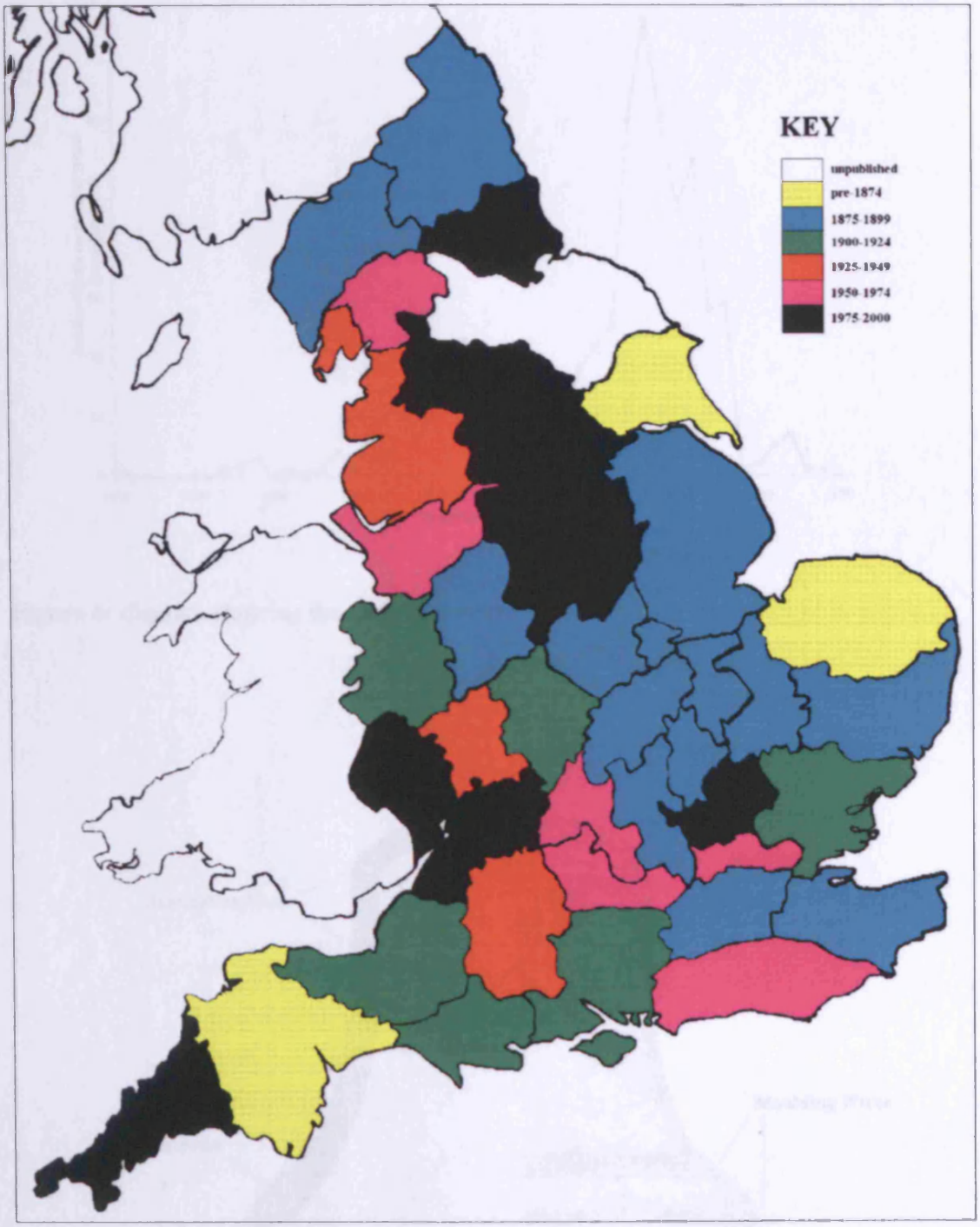


Figure 5: number of bells recorded as being recast by decade (n=606 of the 750 bells known to have been recast)

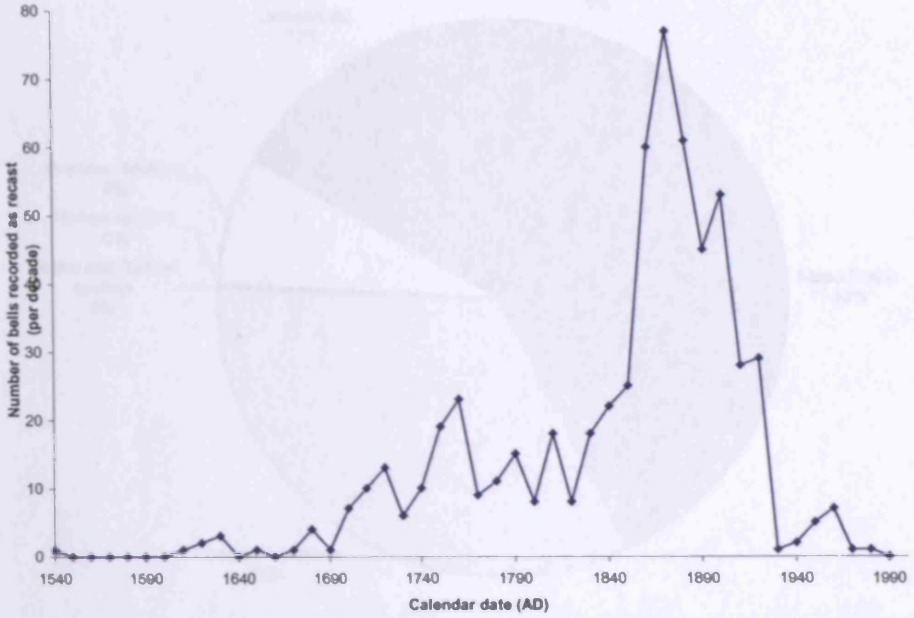


Figure 6: diagram showing the parts of a medieval bell

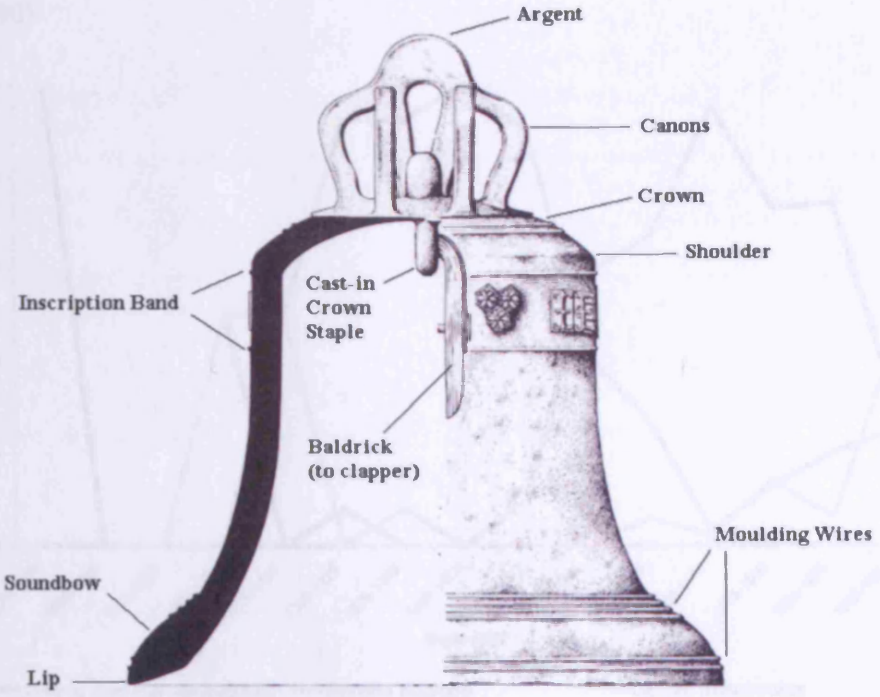


Figure 7: types of lettering used for inscriptions on medieval bells (n=4797)

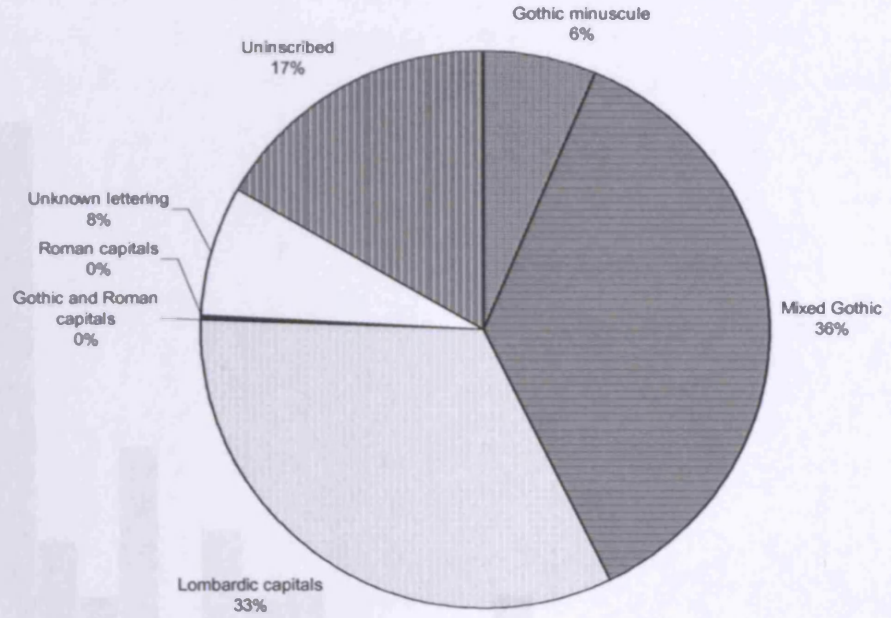


Figure 8: lettering types on bells whose date is known from sources external to the incidence matrix of stamps and bells (see Chapter 2): as a proportion of all dated bells in each date range (n=690)

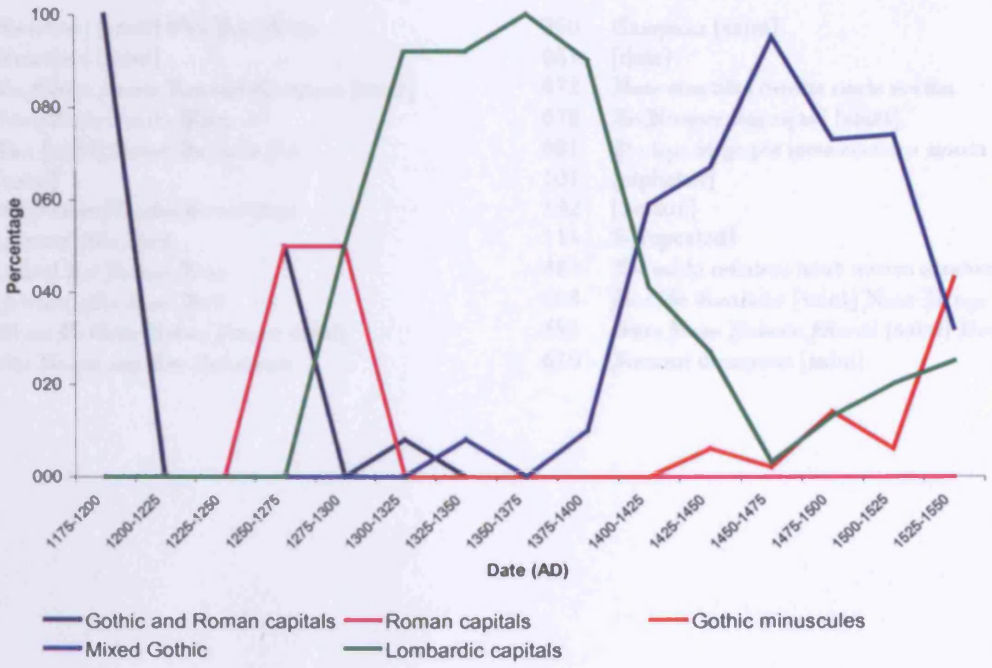
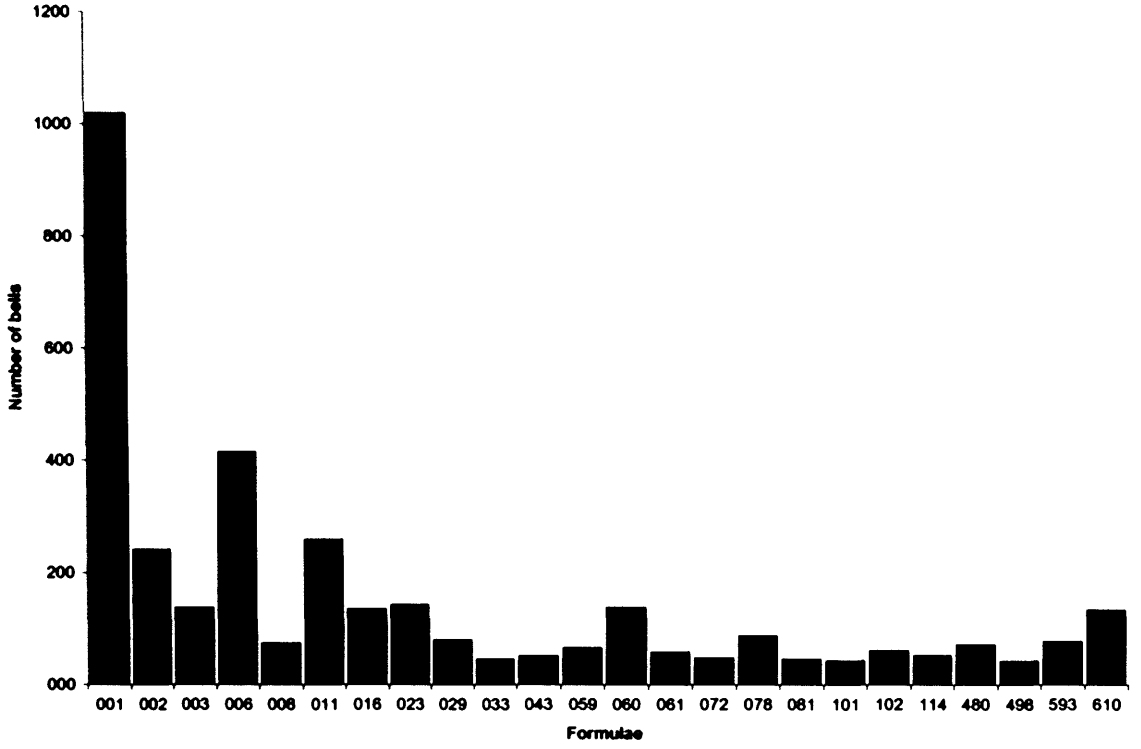


Figure 9: number of bells inscribed using generic formulae



Key

001 Sanct[ae] [saint] Ora Pro Nobis
002 Sanct[ae] [saint]
003 In Multis Annis Resonet Campana [saint]
006 Ave Maria Gracia Plena
008 Vox [saint] Sonet In Aure Dei
011 [saint]
016 Sit Nomen Domini Benedictum
023 [person] Me Fecit
029 [saint] Est Nomen Eius
033 [person] Me Fieri Fecit
043 Missi De Celis Habeo Nomen saint]
059 Ihc Nazarenus Rex Judeorum
060 Campana [saint]
061 [date]
072 Voce mea viva depello cuncta nociva
078 In Honore Sanct[ae] [saint]
081 Protege virgo pia quos convoco sancta maria
101 [alphabet]
102 [person]
114 S[repeated]
480 Est michi collatum istud nomen amatum
498 Hac In Conclave [saint] Nunc Plange Suave
593 Sum Rosa Pulsata Mundi [saint] Vocata
610 Resonet Campana [saint]

Figure 10: map showing the distribution of bells bearing generic formulae Voce mea viva depello cuncta nociva (■), Plebs ois plaudit ut me tam sepius audit (■), Protege virgo pia quos conboco sancta maria (■), and Est michi collatum istud nomen amatum (■)

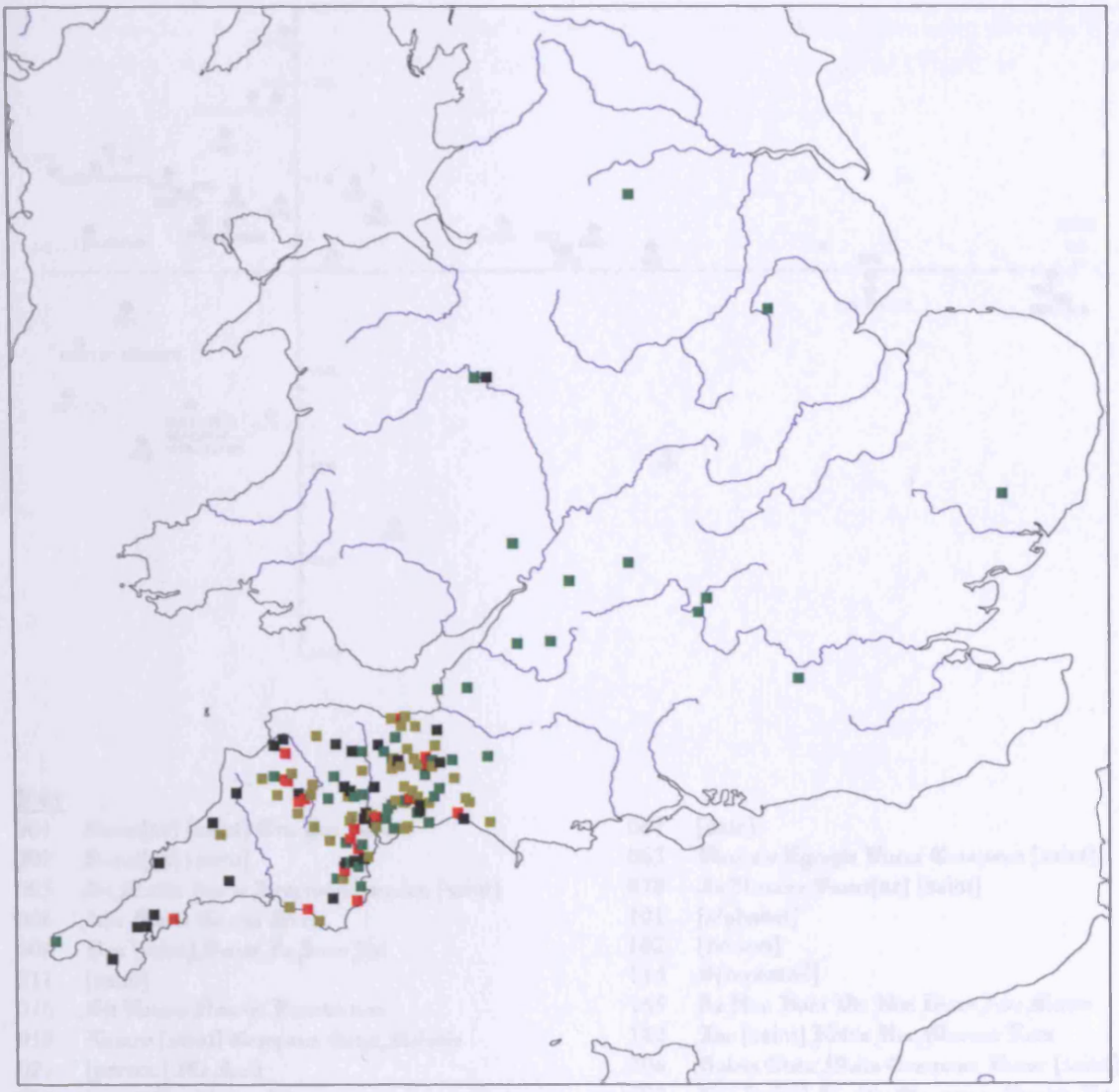
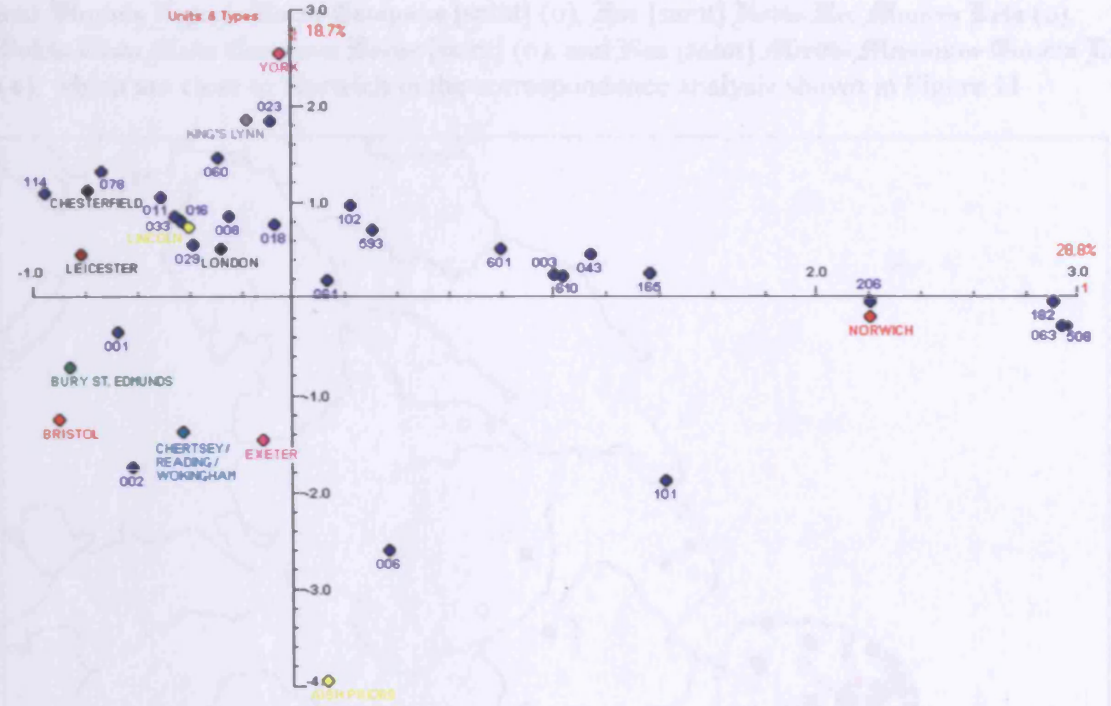


Figure 11: correspondence analysis of the abundance of generic formulae on bells independently ascribed to particular foundries (axes 1 and 2)



Key

001 Sanct[ae] [saint] Ora Pro Nobis
002 Sanct[ae] [saint]
003 In Multis Annis Resonet Campana [saint]
006 Ave Maria Gracia Plena
008 Vox [saint] Sonet In Aure Dei
011 [saint]
016 Sit Nomen Domini Benedictum
018 Nomen [saint] Campana Geret Melodie
023 [person] Me Fecit
029 [saint] Est Nomen Eius
033 [person] Me Fieri Fecit
043 Missi De Celis Habeo Nomen [saint]
060 Campana [saint]
061 [date]
063 Virginis Egregie Vocor Campana [saint]
078 In Honore Sanct[ae] [saint]
101 [alphabet]
102 [person]
114 S[repeated]
165 Ac Non Vadi Via Nisi Dicas Ave Maria
182 Fac [saint] Nobis Hec Munera Leta
206 Dulcis Cisto Melis Campana Vocor [saint]
508 Nos [saint] Meritis Mereamur Gaudia Lucis
593 Sum Rosa Pulsata Mundi [saint] Vocata
601 [saint] miserere mei
610 Resonet Campana [saint]

Figure 12: map showing the distribution of bells bearing generic formulae [...] Campana Laude [saint] (■), [saint] Ad Eterne Ducat Nos Pascua Vite (■), and Hac In Conclave [saint] Nunc Pange Suave (■), which occur only on documented bells from the Norwich foundry, and Virginis Egregie Vocor Campana [saint] (o), Fac [saint] Nobis Hec Munera Leta (o), Dulcis Cisto Melis Campana Vocor [saint] (o), and Nos [saint] Meritis Mereamur Gaudia Lucis (●), which are close to Norwich in the correspondence analysis shown in Figure 11

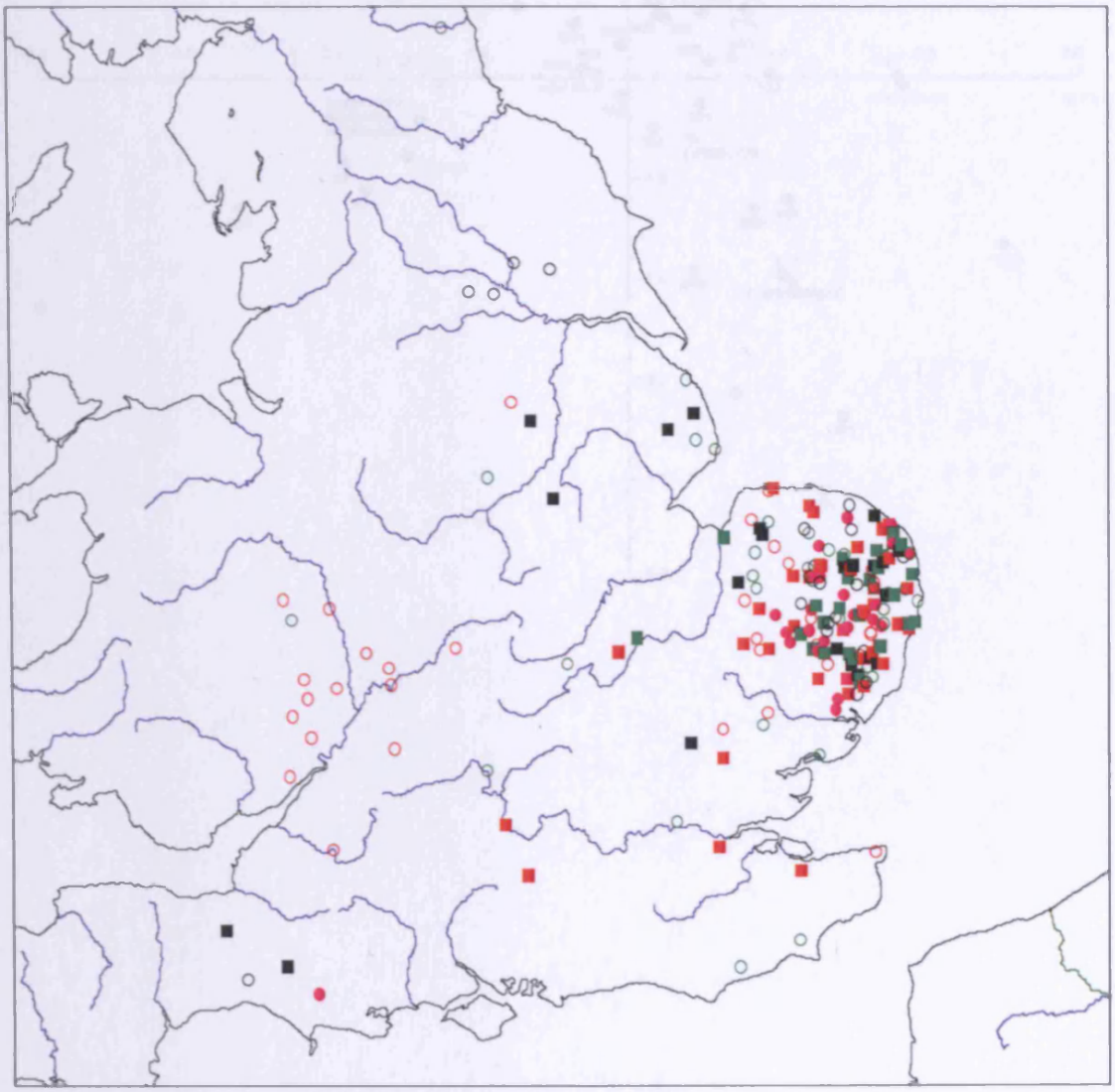


Figure 13: correspondence analysis of the abundance of generic formulae on bells independently ascribed to particular foundries (axes 2 and 3) (for key see Fig 11)

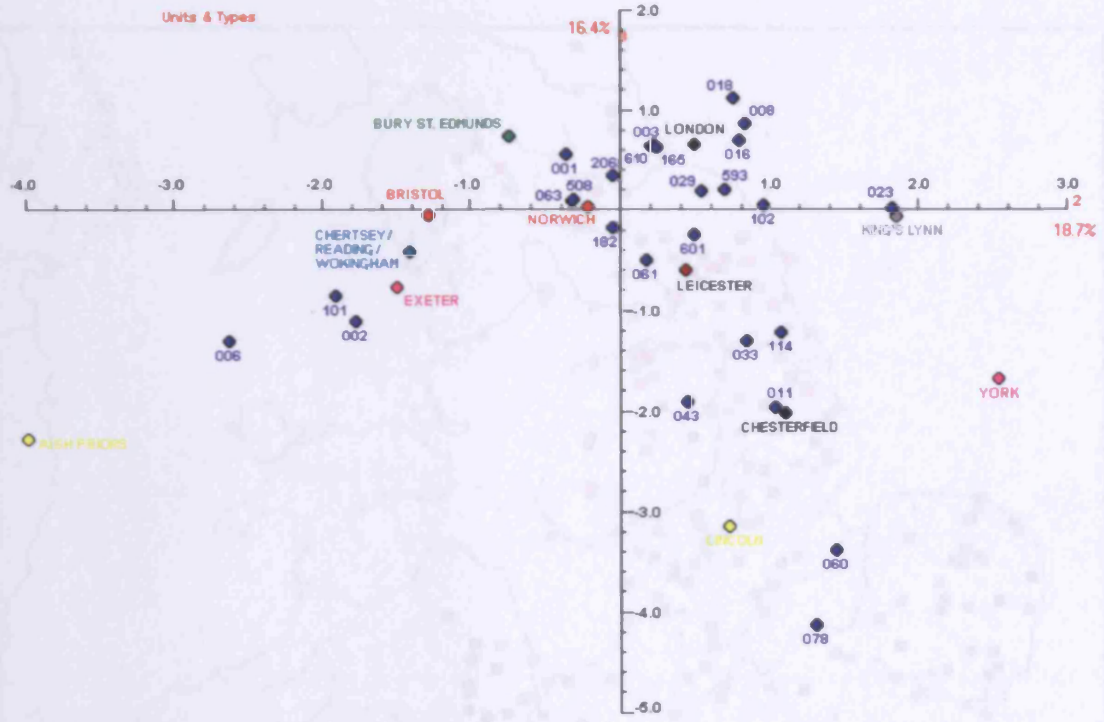


Figure 14: : map showing the distribution of bells bearing generic formulae Missi De Celis Habeo Nomen [saint] (■), In Honore Sanct[ae] [saint] (■), and Campana [saint] (■), which cluster towards the northern foundries in the correspondence analysis shown in Figure 13

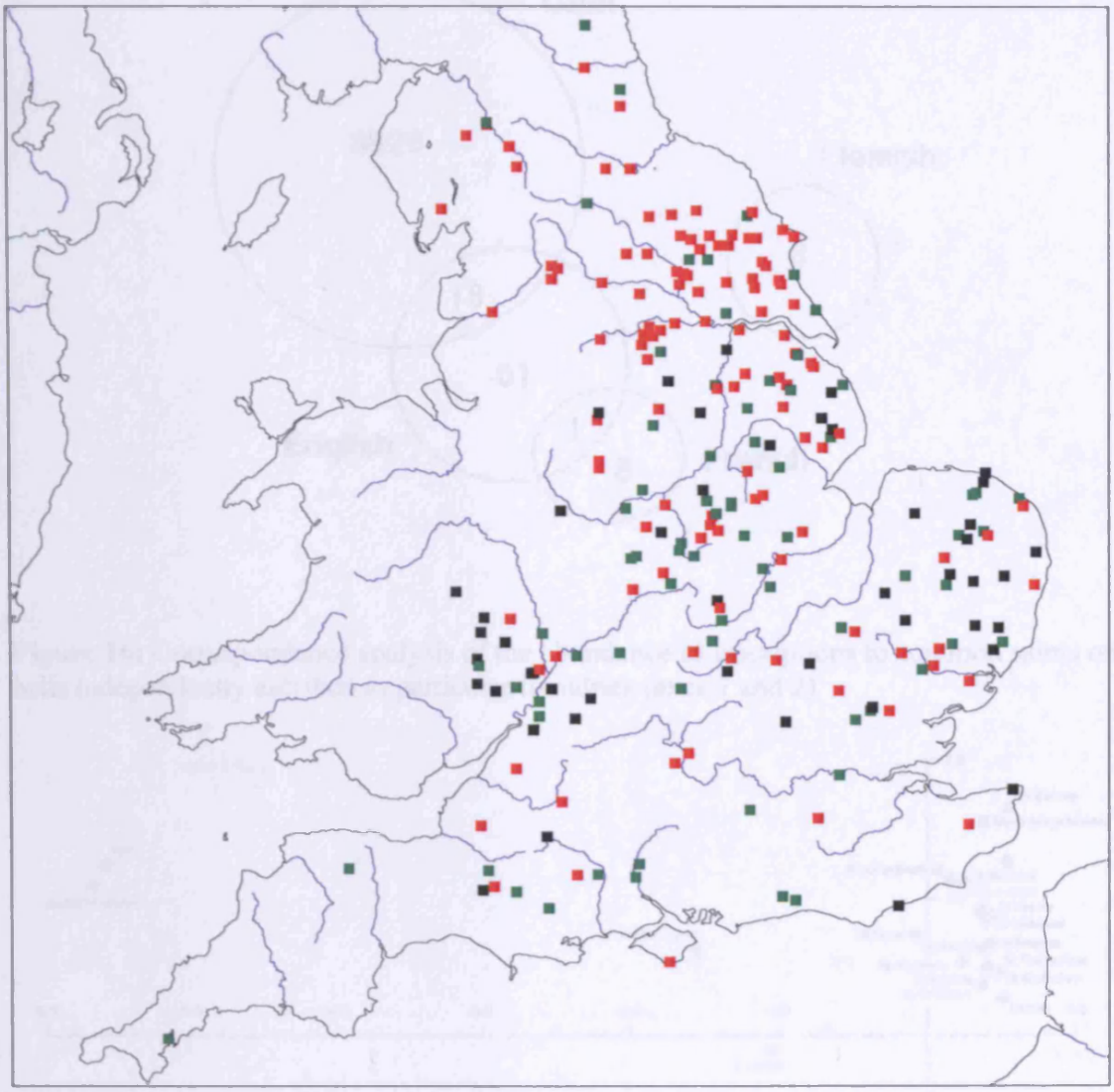


Figure 15: Venn diagram showing the language in which medieval bells were inscribed (n=3723)

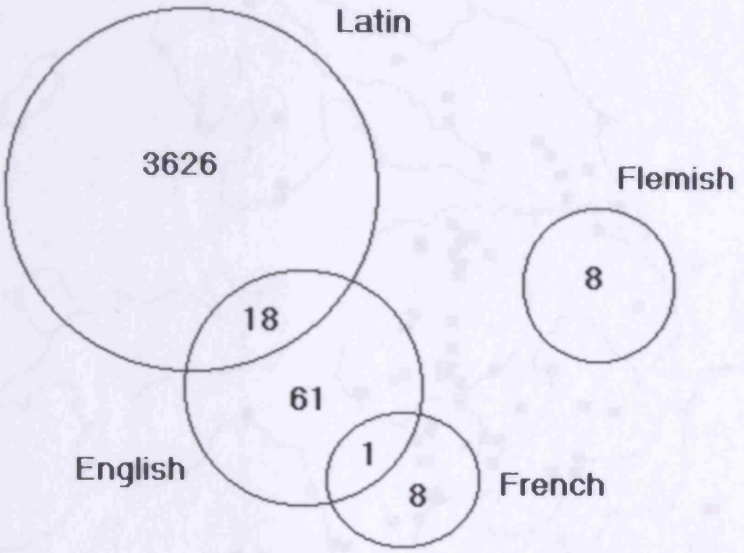


Figure 16: Correspondence analysis of the abundance of inscriptions to common saints on bells independently ascribed to particular foundries (axes 1 and 2)

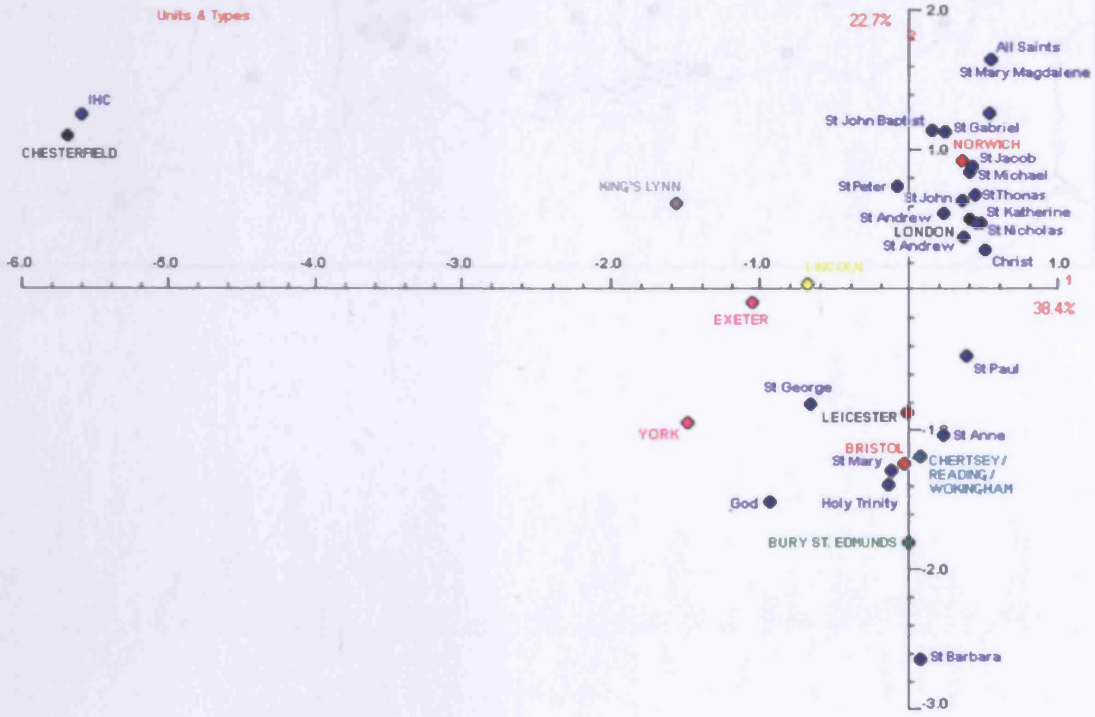


Figure 17: distribution of bells with inscriptions dedicated to Jesus (■) and St Barbara (■)

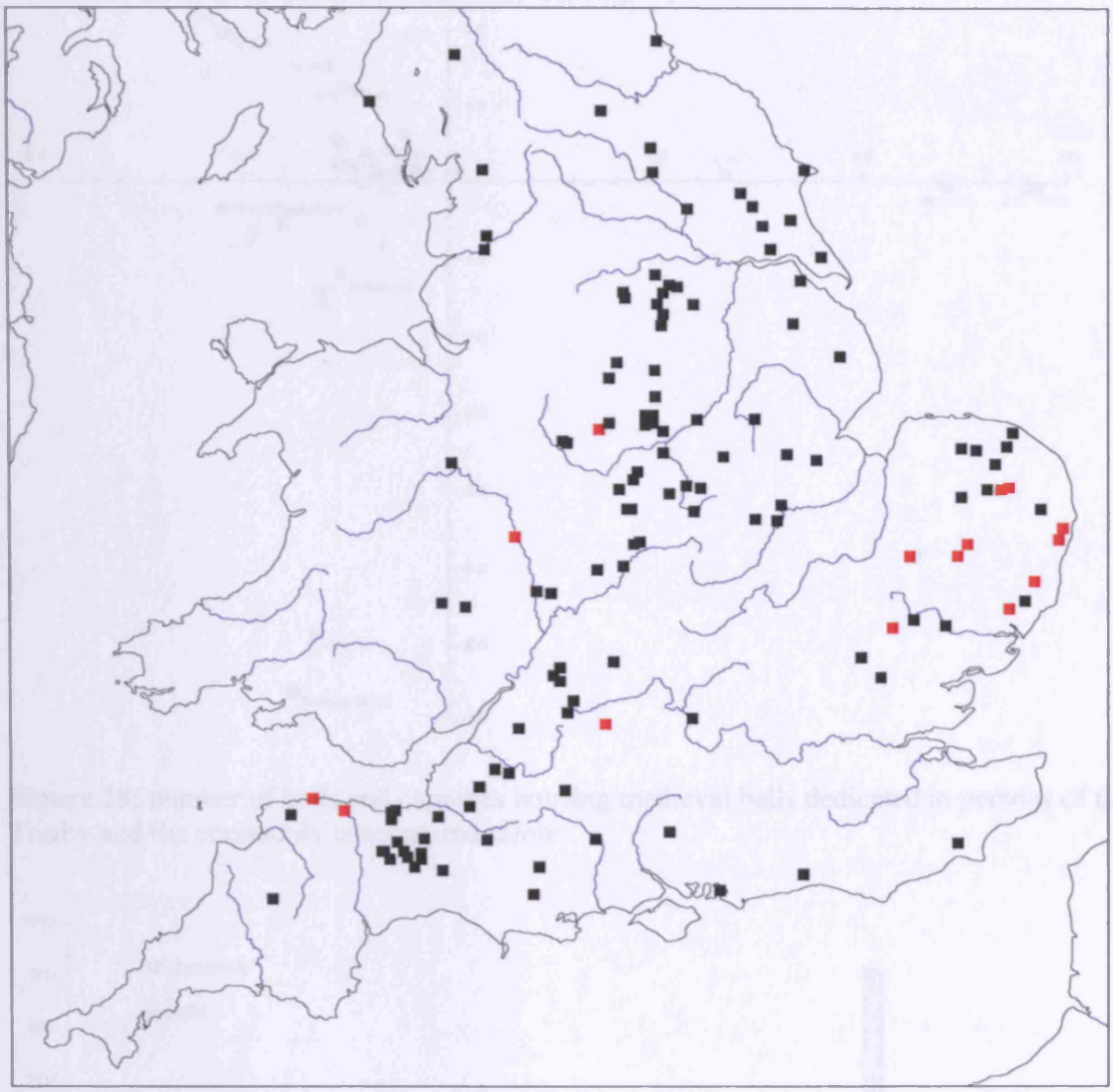


Figure 18: correspondence analysis of the abundance of generic formulae on bells inscribed with dedications to common saints (for key see Fig 11)

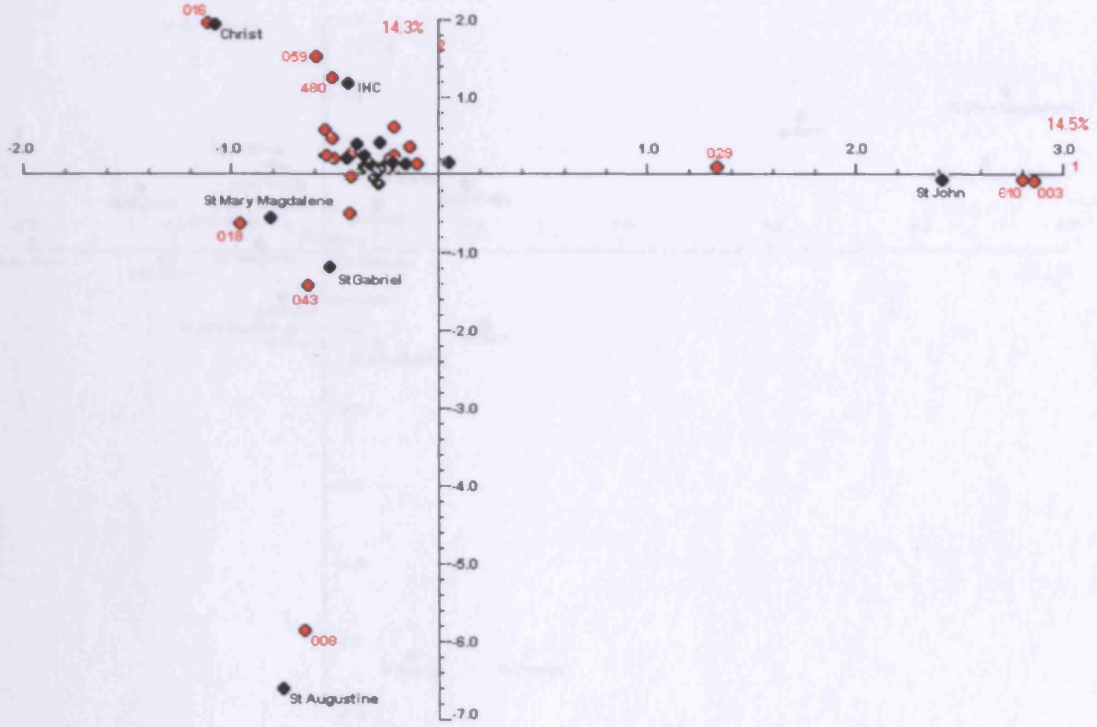


Figure 19: number of bells and churches housing medieval bells dedicated to persons of the Trinity and the commonly encountered saints

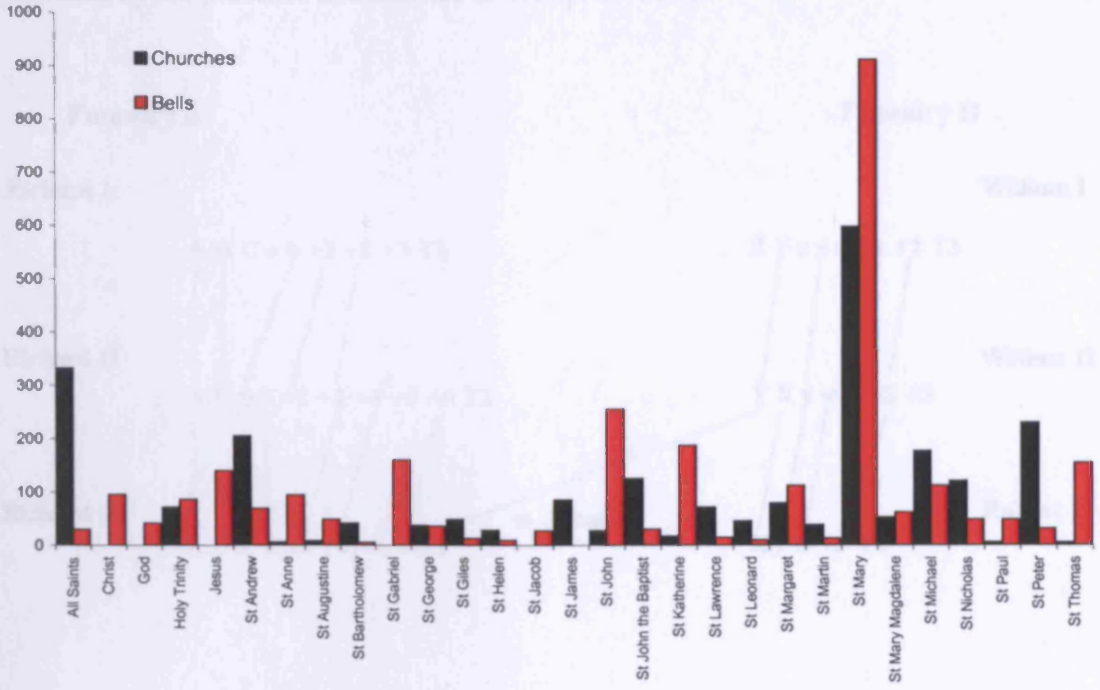


Figure 20: correspondence analysis of the abundance of bells inscribed with dedications to common saints (blue) in churches inscribed to the same saints (black)

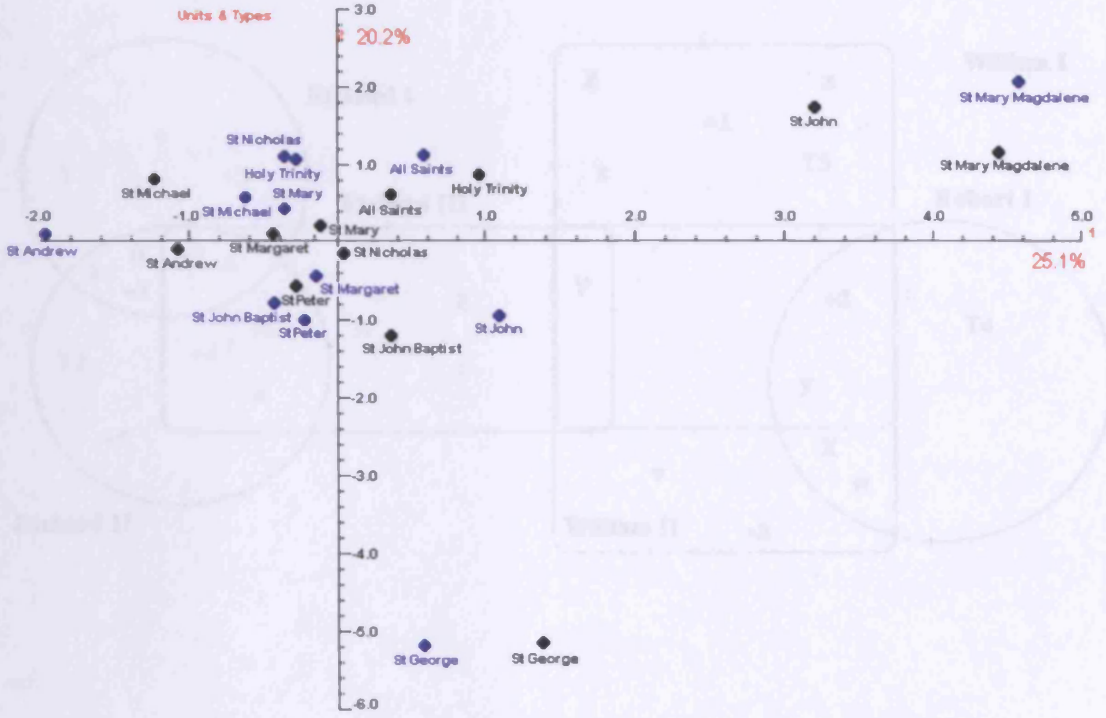


Figure 21: illustration of the anticipated structure of founders, foundries, and chronology produced by the presence and absence of stamps on bells

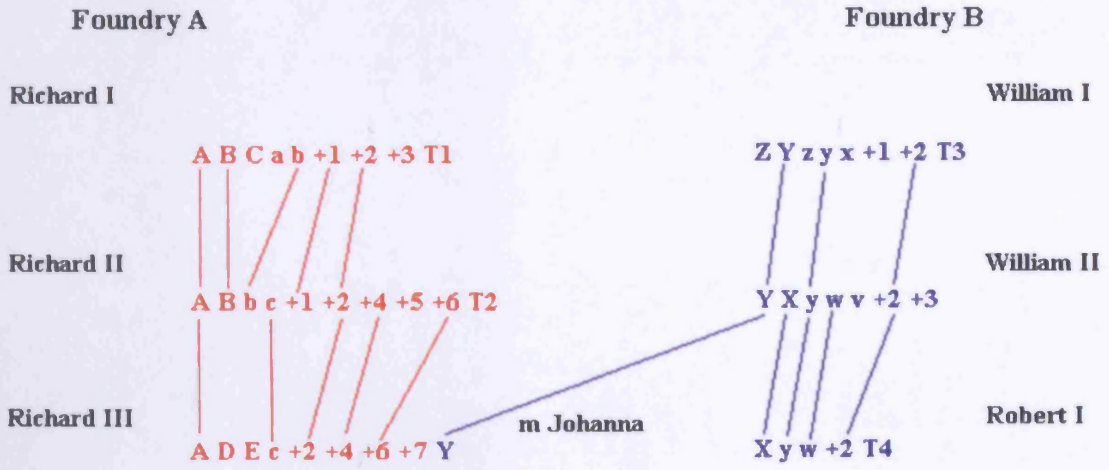


Figure 22: illustration of the clusters anticipated from the succession of founders shown in Figure 21

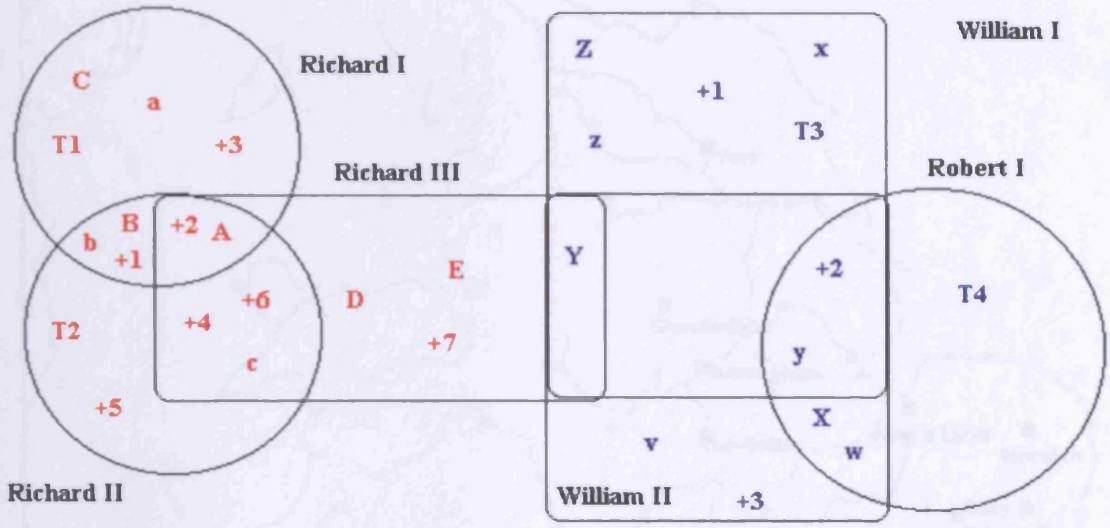


Figure 23: map showing the centres of bellfounding in medieval England known from documentary sources (■ principal centres; ● minor centres)

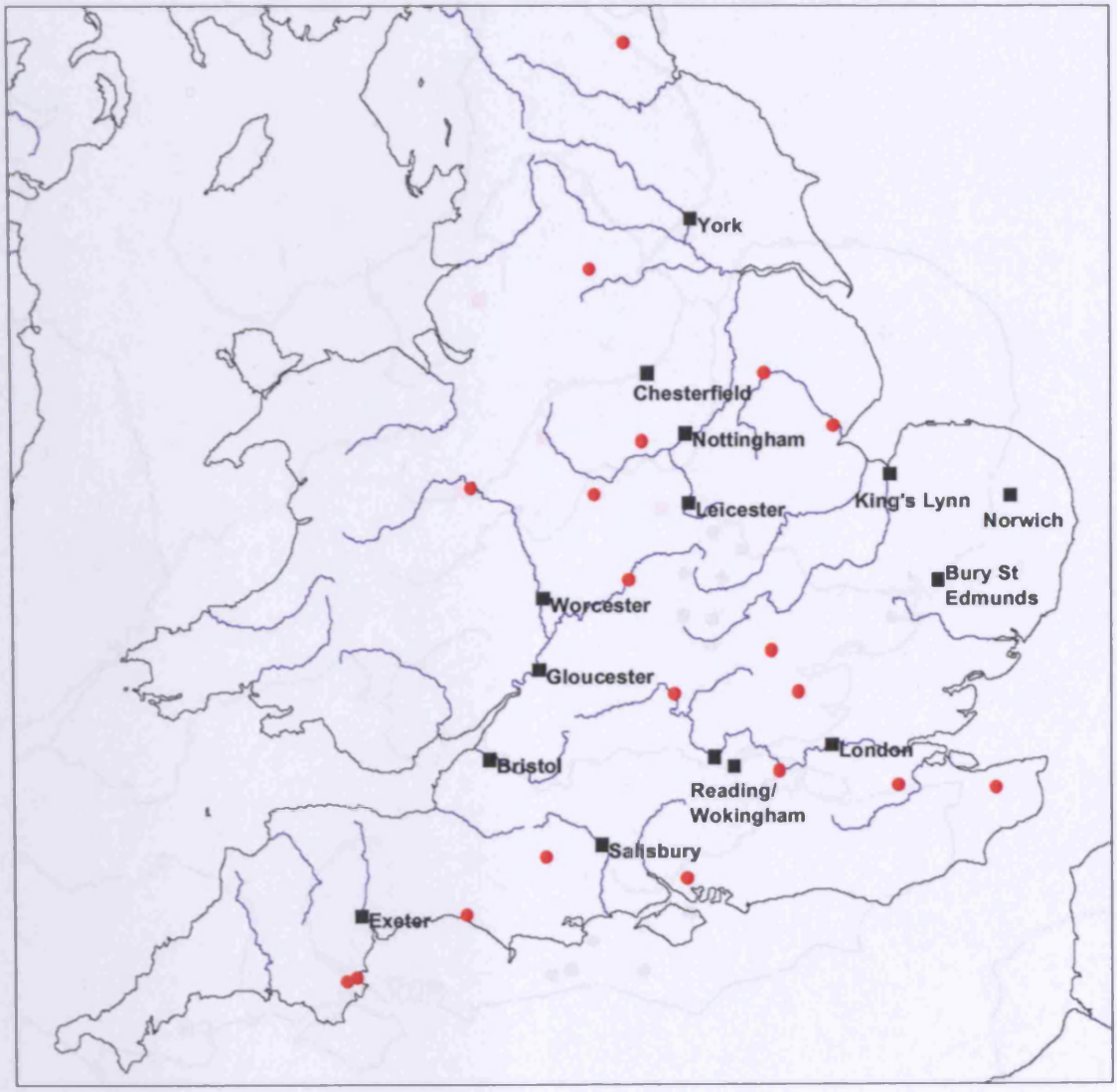


Figure 24: map showing the distributions of surviving bells bearing the names of John Tonne (●) and John of York (▪)

Figure 25: map showing the distributions of surviving medieval bells bearing stamps 3.0011(■), 3.0012 (•), 3.0042(■), and 3.0078(•)

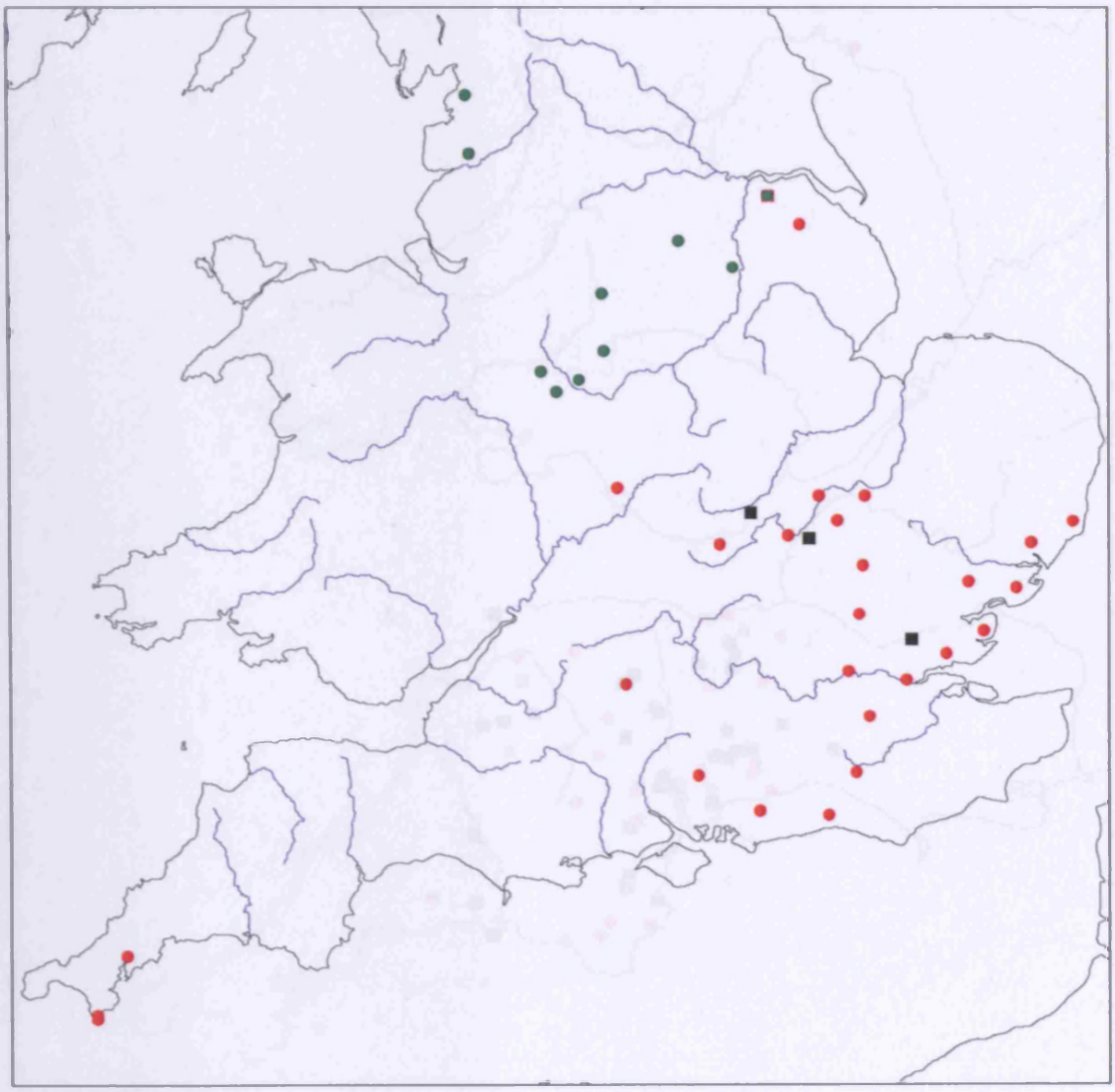


Figure 26: map showing the distributions of surviving medieval bells bearing stamps 3.0030 (●) and 3.0031(■)

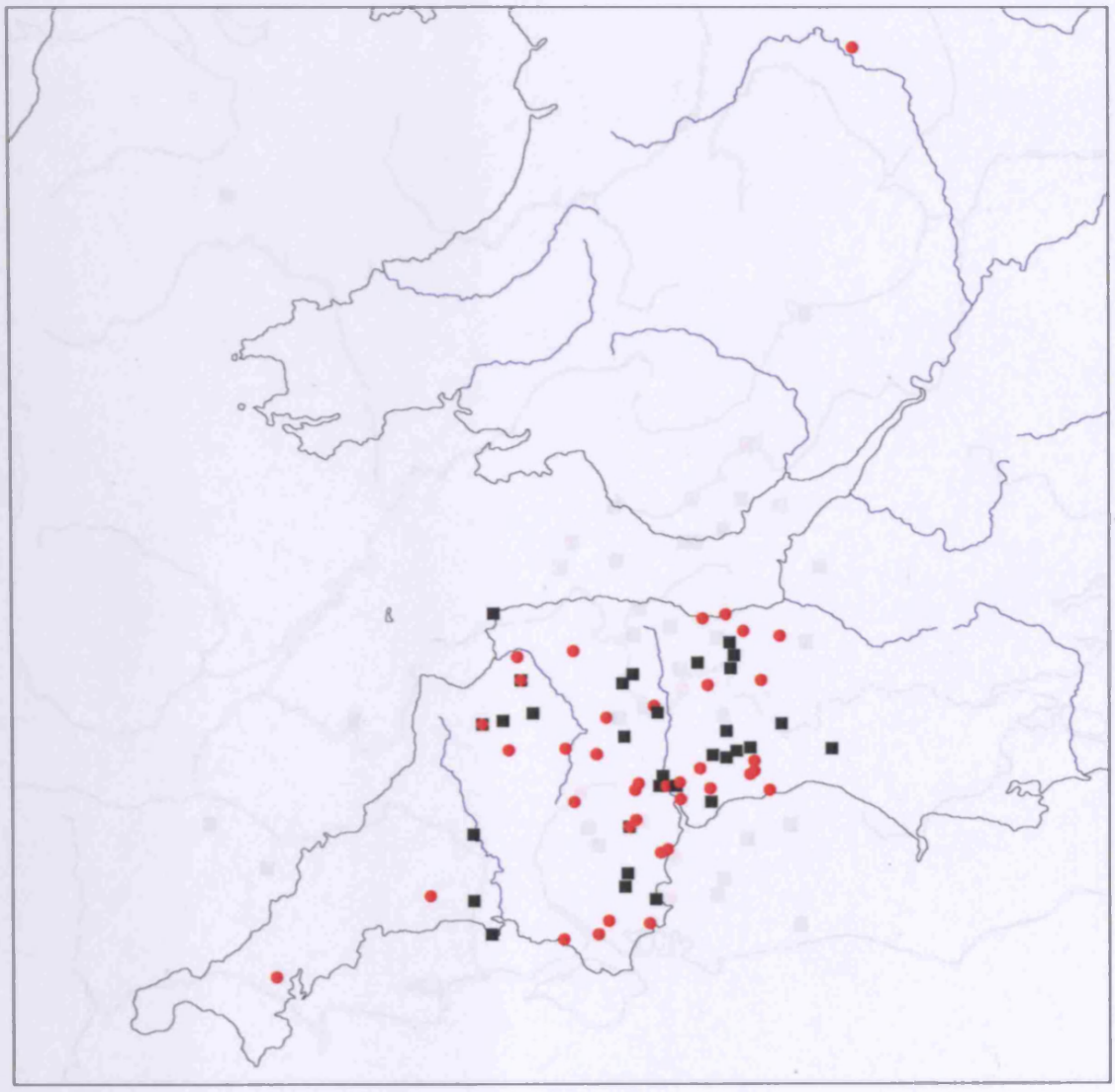


Figure 27: map showing the distributions of surviving medieval bells bearing stamps 3.0018 (■) and 3.0021 (●)

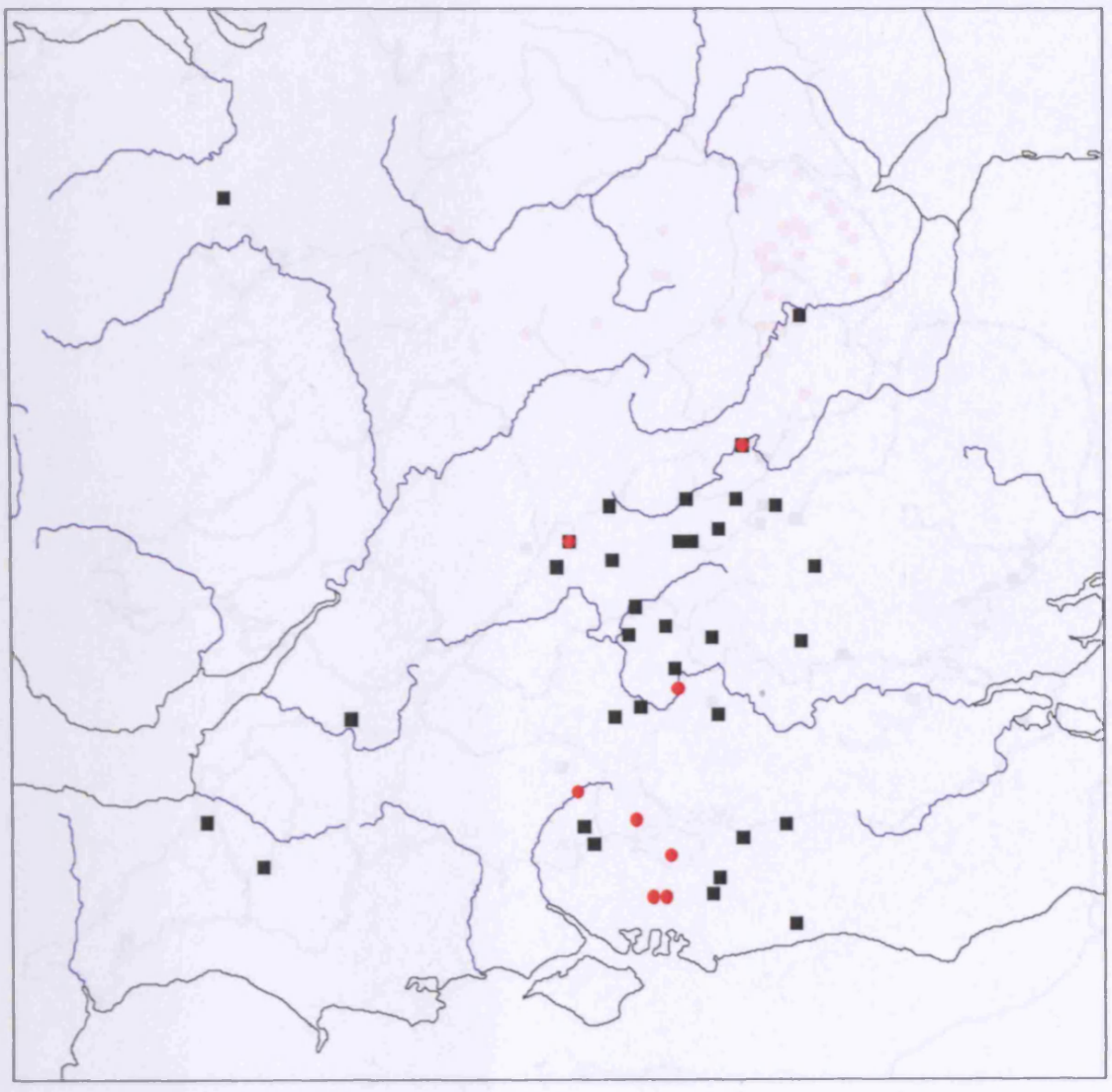


Figure 28: map showing the distributions of surviving medieval bells bearing stamps 3.0004 (■) and 3.0044 (●)

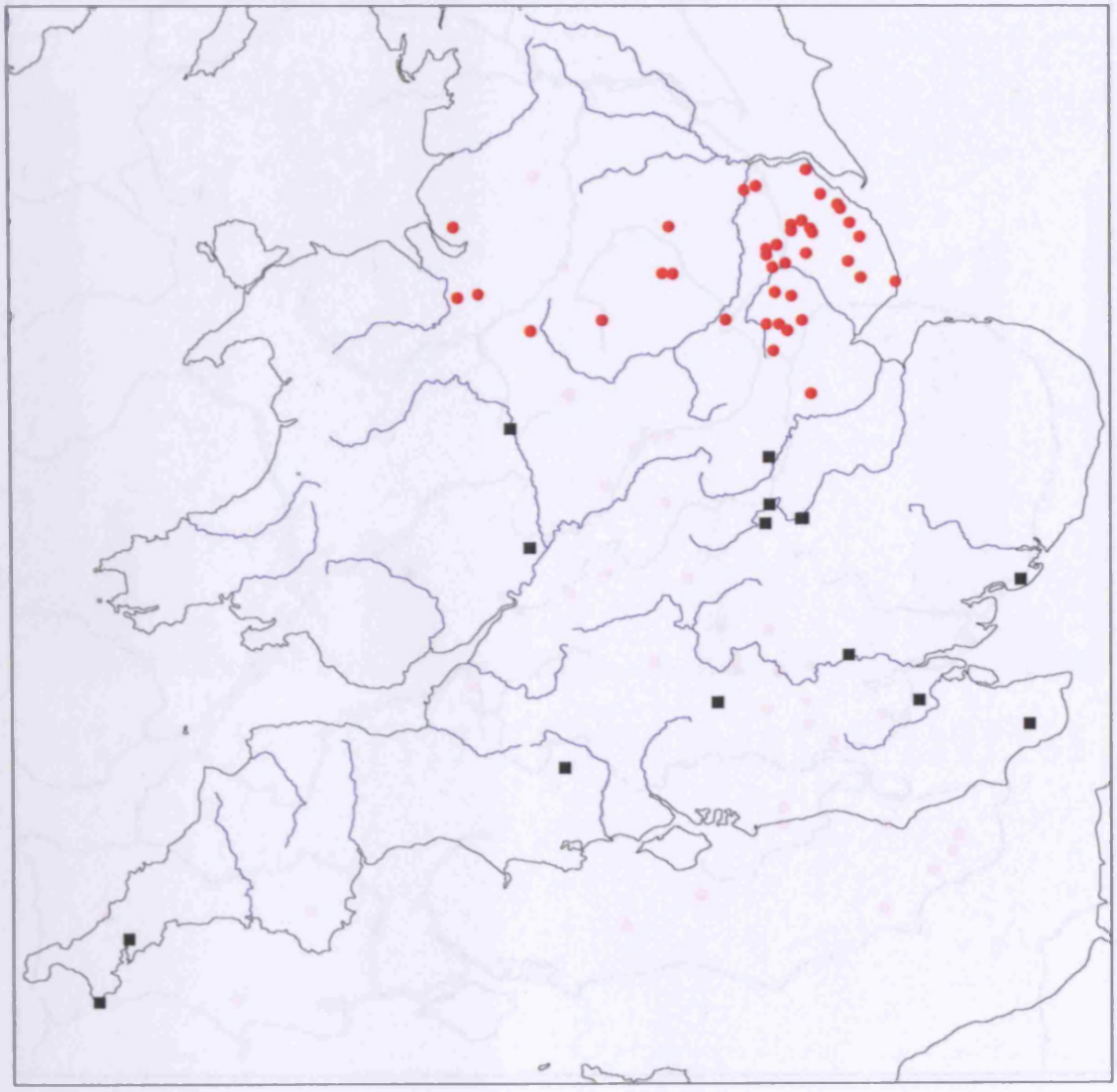


Figure 29: map showing the distributions of surviving medieval bells bearing stamp 3.0013

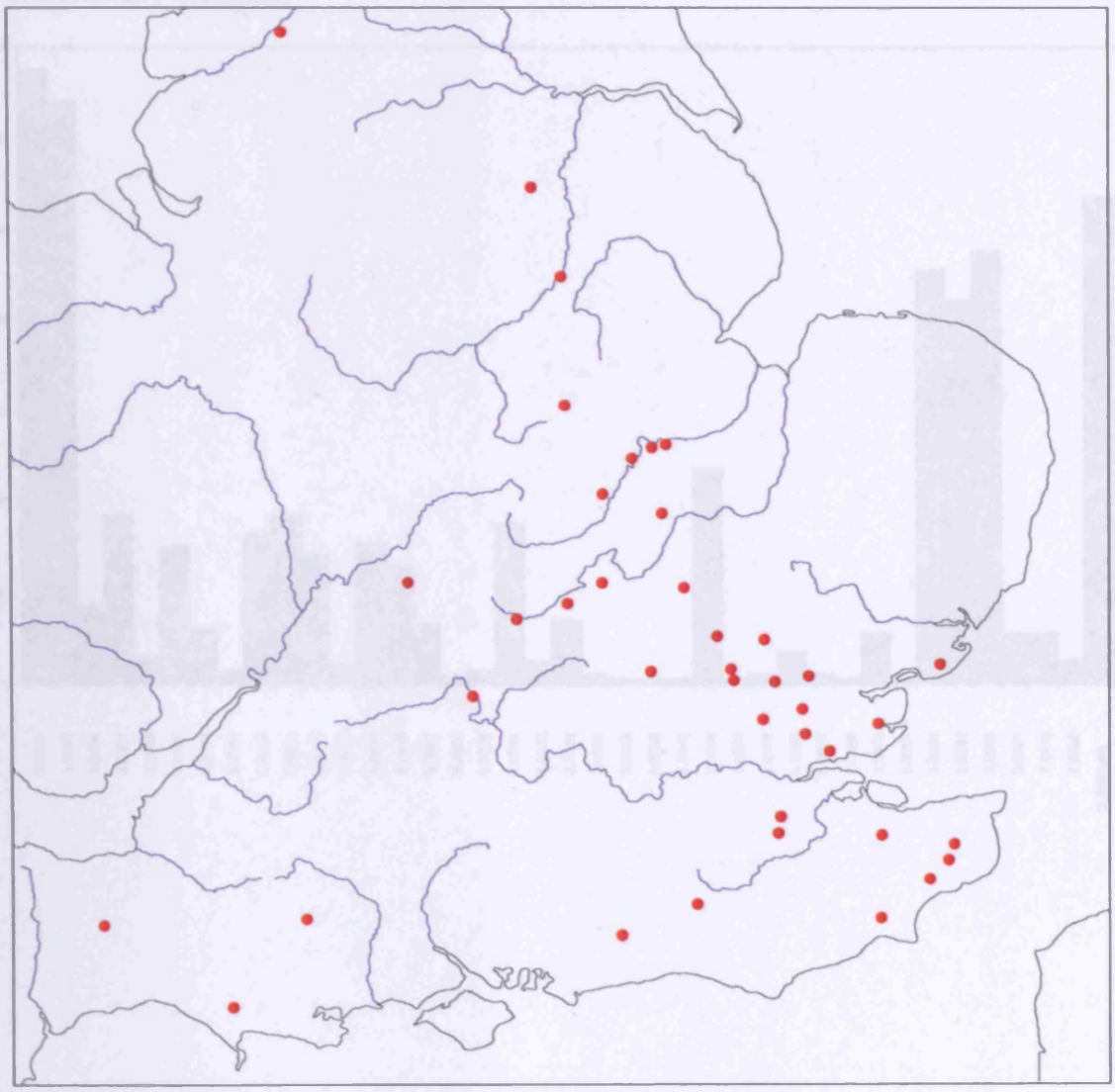


Figure 30: histogram showing the number of surviving bells bearing devices which have been allocated to founders (■), foundries (■), and donors (■) on the basis of documentary evidence

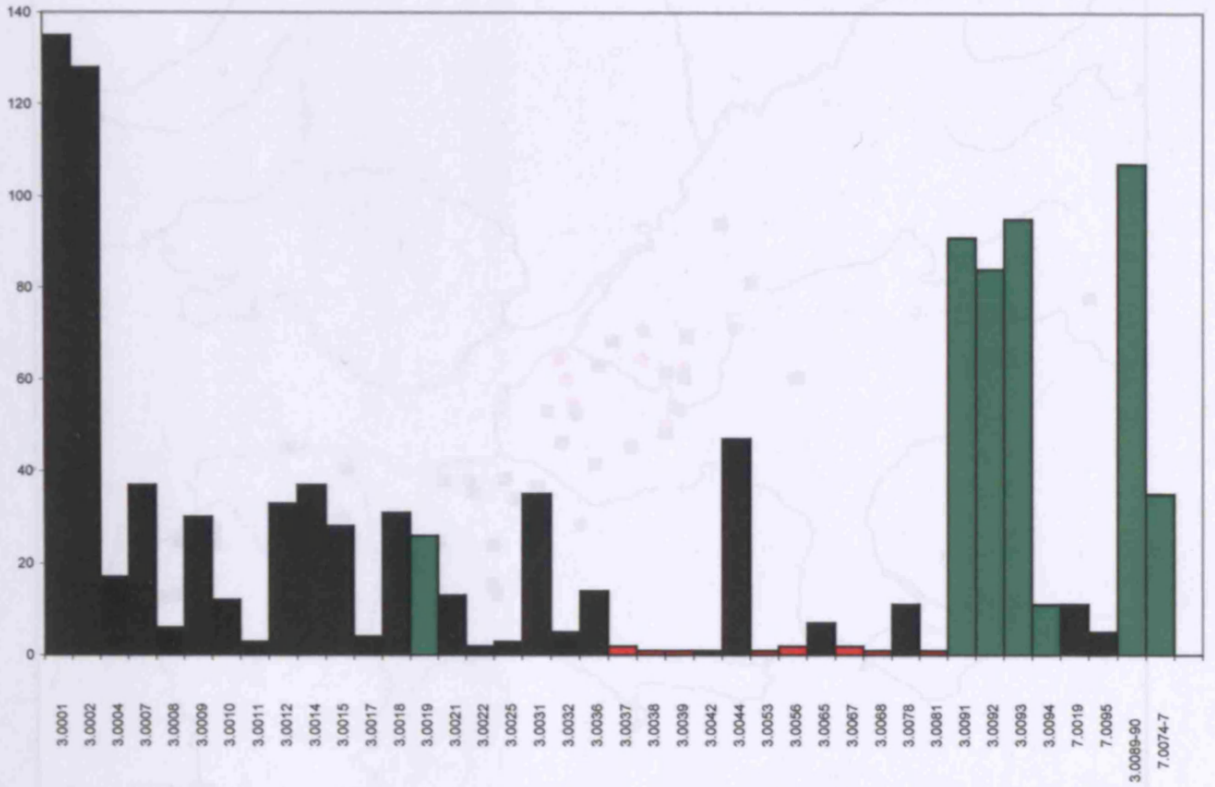


Figure 31: map showing the distributions of surviving medieval bells bearing the initials 'tg' (■), 'hi' (●), and 'rt' (●)

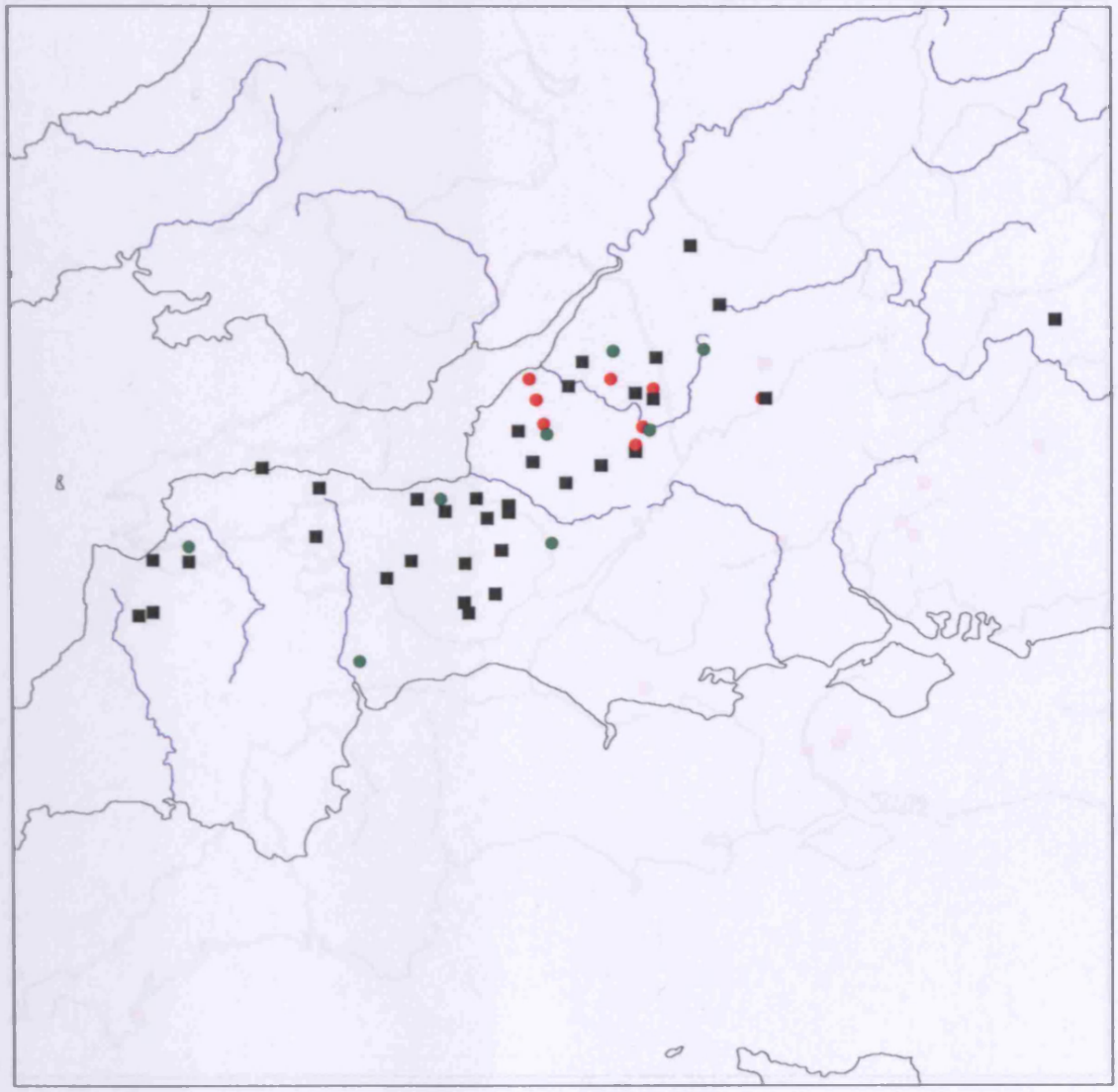


Figure 32: map showing the distributions of surviving medieval bells bearing the initials 'WH'

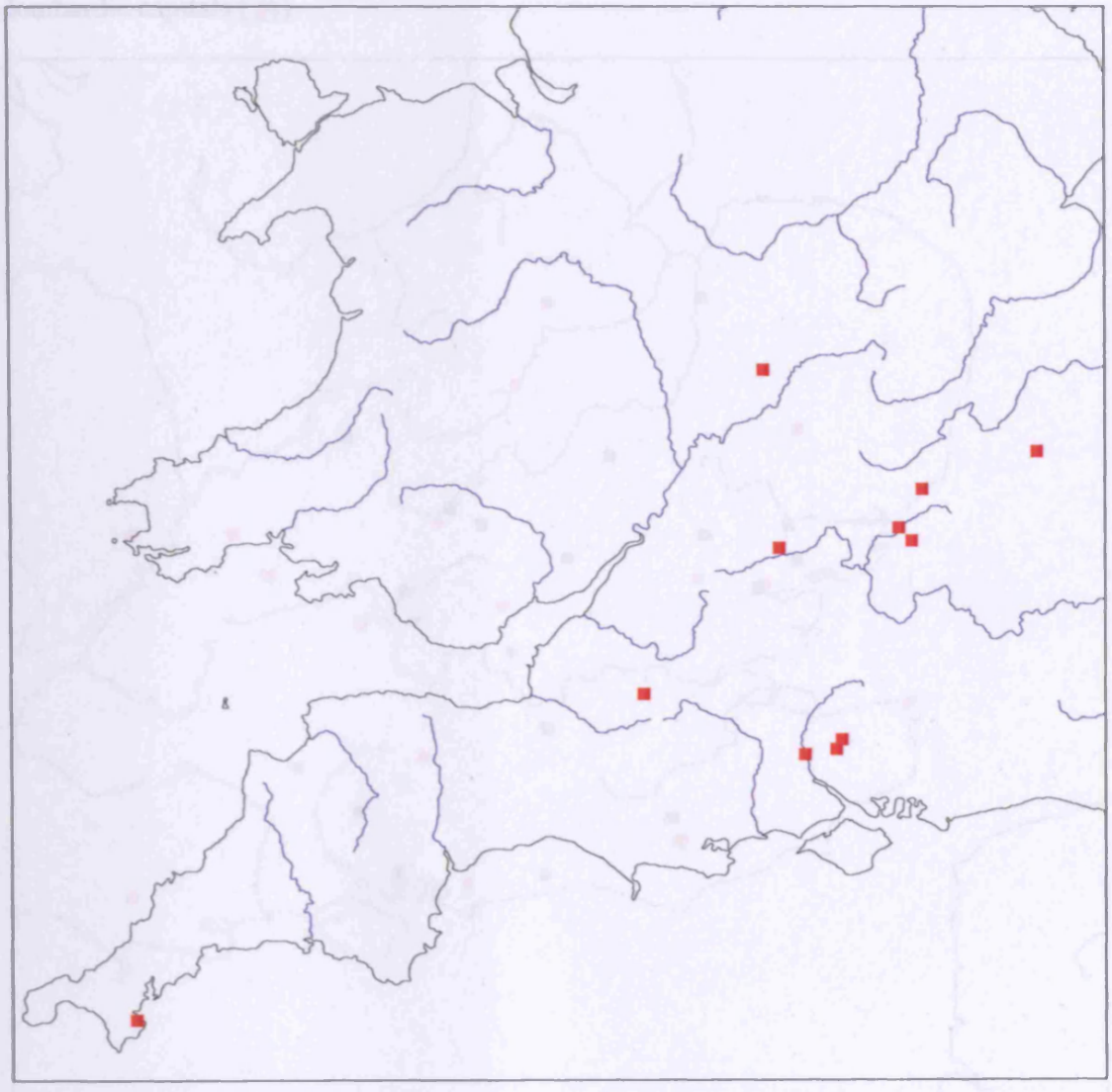


Figure 33: map showing the distributions of medieval bells attributed to John (●) and Johanna Sturdy (■), or otherwise bearing the initials 'IS' in gothic minuscule (●) or lombardic capitals (■)

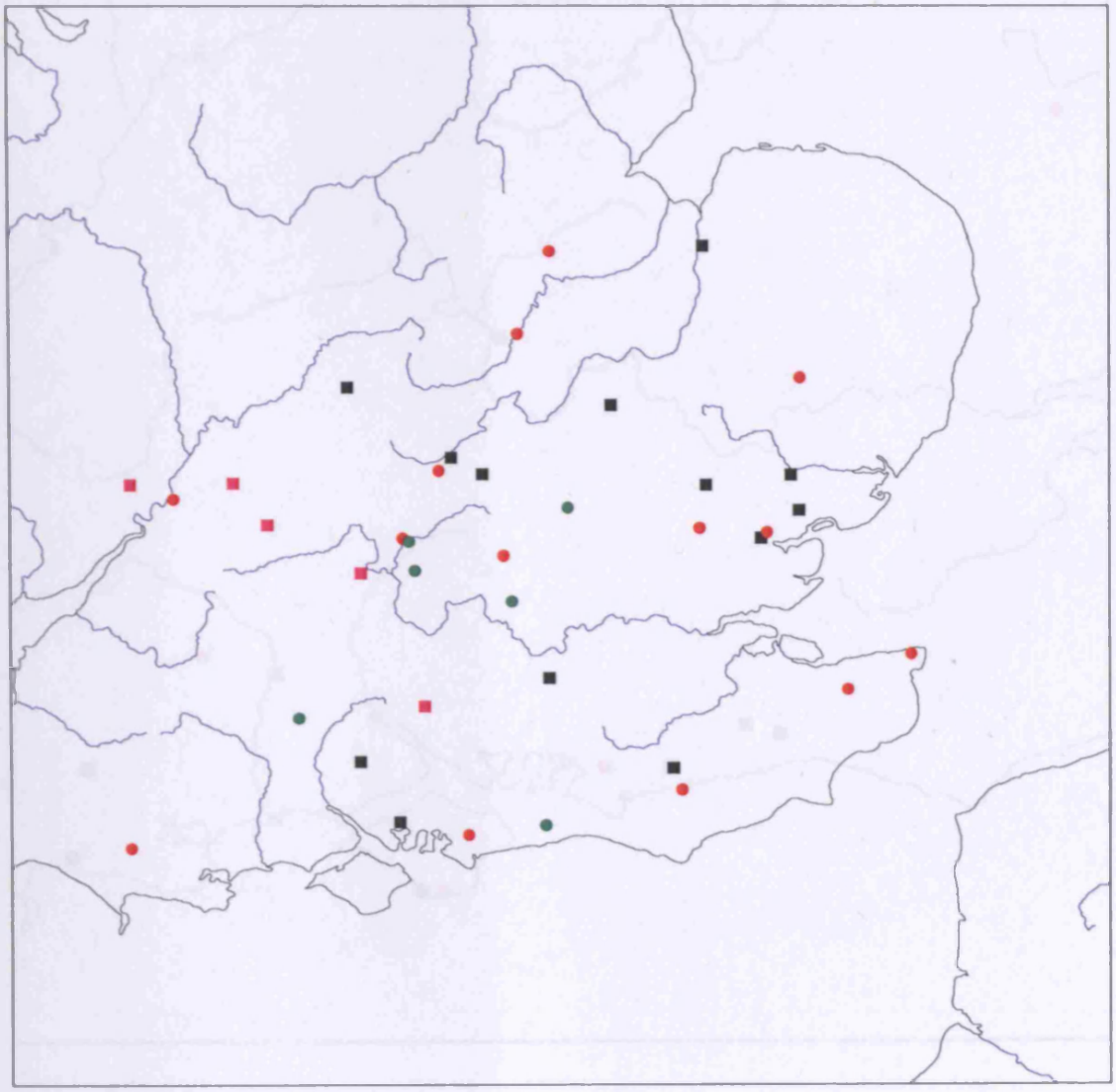


Figure 34: map showing the distributions of surviving medieval bells bearing the initials 'R' (■) and 'PW' (●)

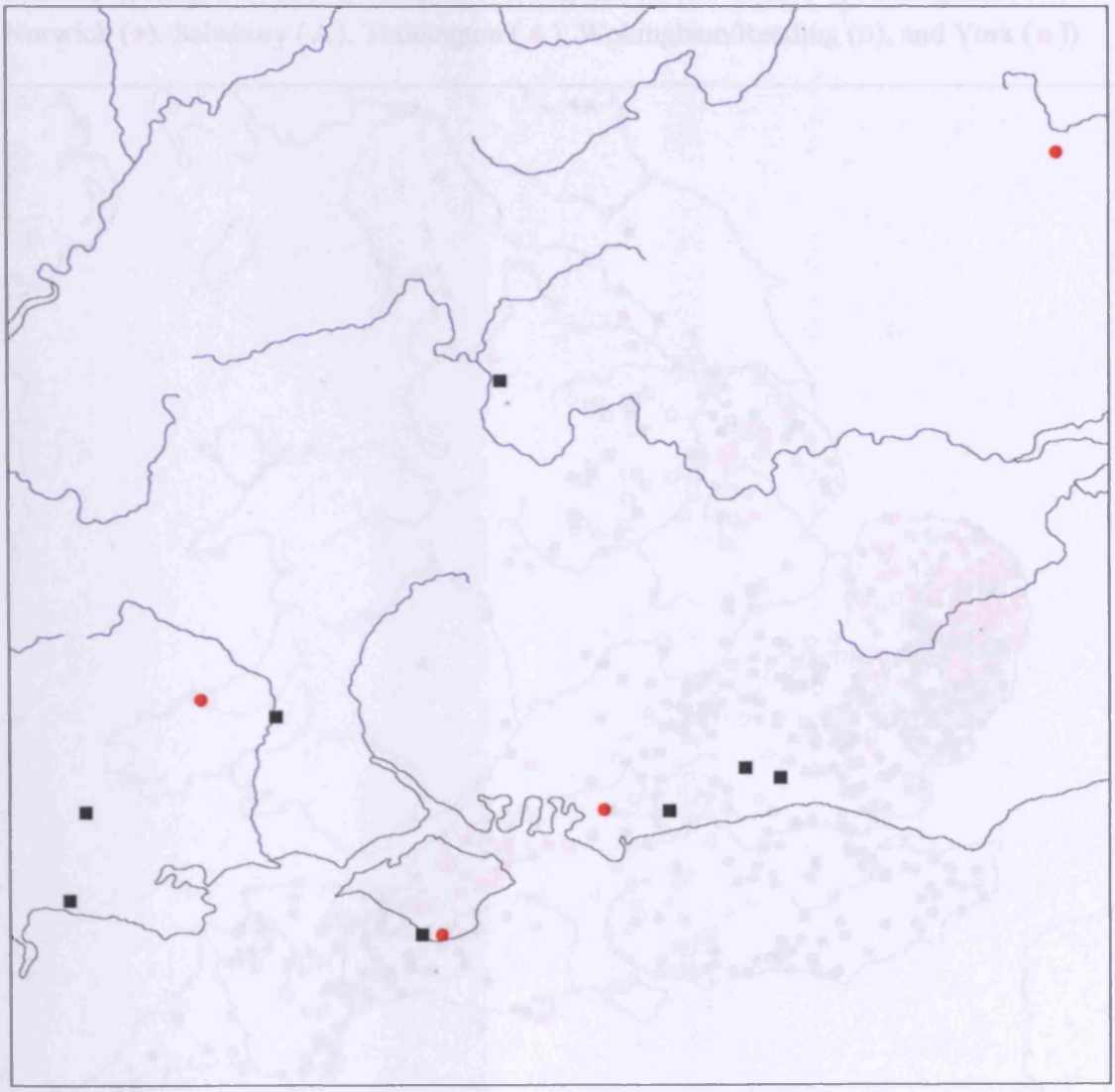


Figure 35: number of medieval bells with evidence of date, founder, or foundry of manufacture external to the incidence matrix of bells and stamps

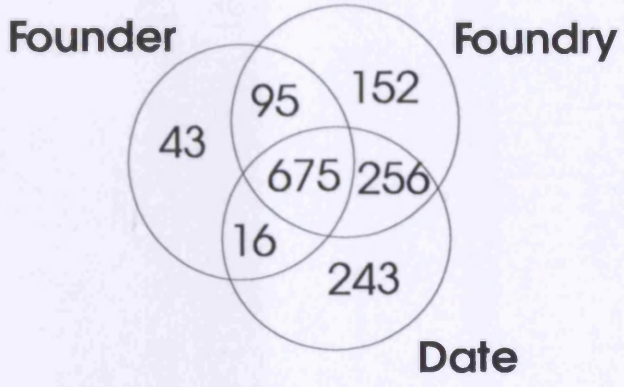


Figure 36: map showing the distribution of bells with independent evidence of the place of manufacture (Aish Priors (■), Bristol (■), Bury St Edmunds (○), Chesterfield (□), Exeter (●), King's Lynn (●), Leicester (●), Lincoln (□), London (●), Nottingham (▲), Norwich (●), Salisbury (▲), Toddington (▲), Wokingham/Reading (○), and York (■))

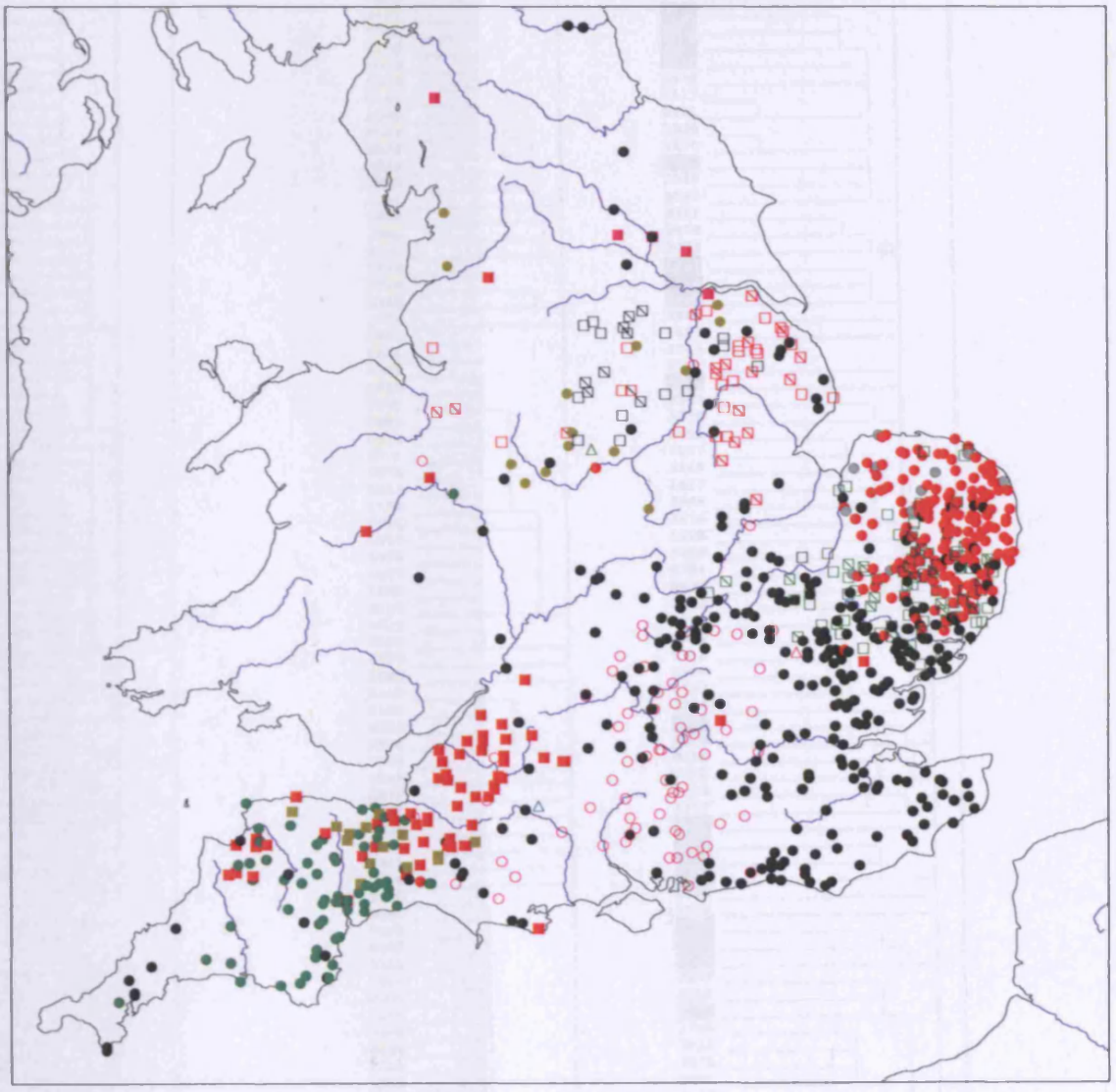
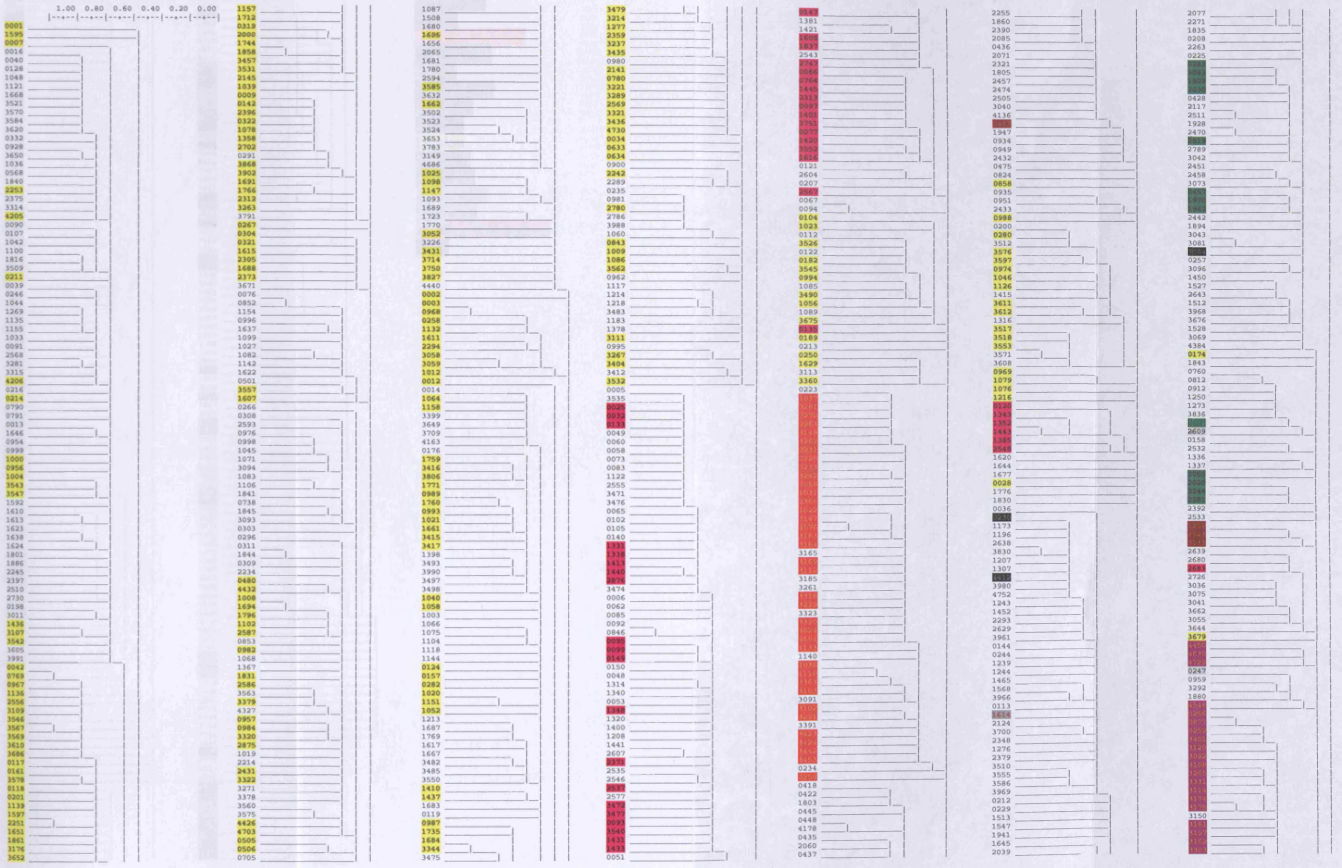


Figure 37: Single-link cluster analysis of units (overall dendrogram)




Key:
Aish Priors
Bristol
Bury St Edmunds
Chesterfield
Exeter
King's Lynn
Leicester
Lincoln
London
Norwich
Salisbury
Toddington
Unknown
Reading/Wokingham
York

Figure 38: number of clusters (containing two or more bells) formed by partitions of the single-link cluster analysis of units at different levels of similarity

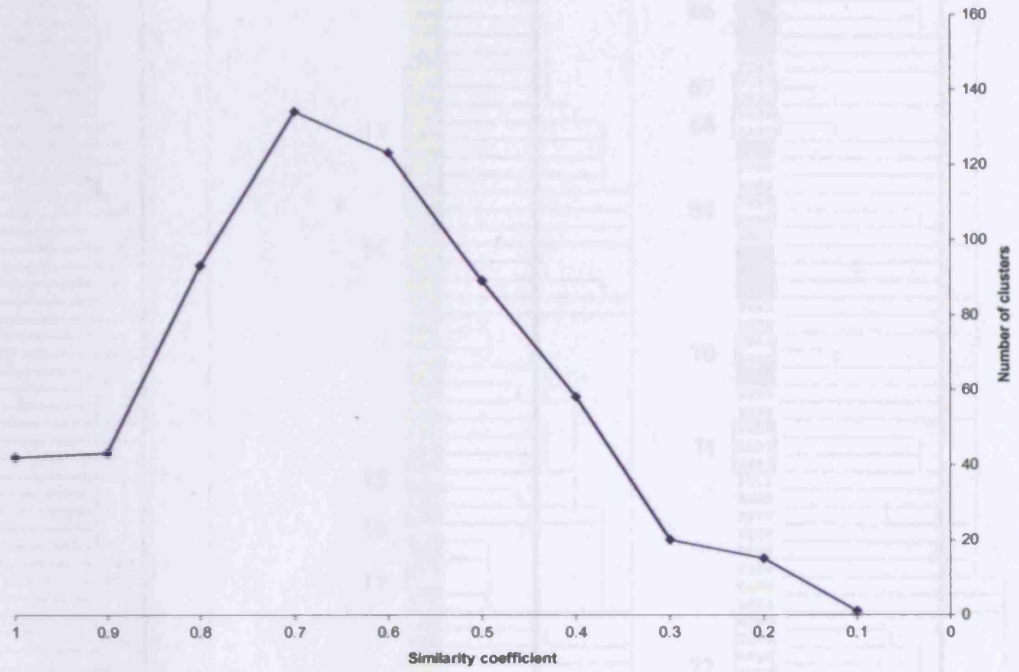


Figure 39: number of bells allocated to clusters by partitions of the single-link cluster analysis of units at different levels of similarity

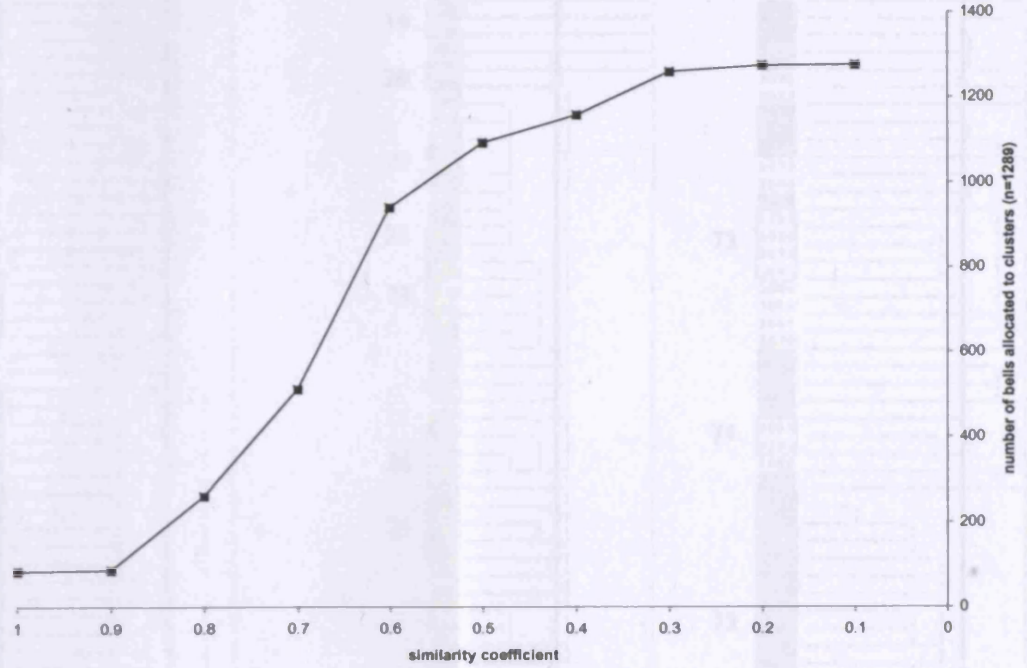


Figure 40: Single-link cluster analysis of units (partition at a similarity level of 0.7)


Key:
Ash Priors
Bristol
Bury St Edmunds
Chesterfield
Exeter
King's Lynn
Leicester
Lincoln
London
Norwich
Salisbury
Toddington
Unknown
Reading/Wokingham
York

Figure 41: percentage error relating to documented founders of partitions at each level of similarity for the single-link cluster analysis of units (for the definition and methods of calculating estimates of Type A and Type B error see text)

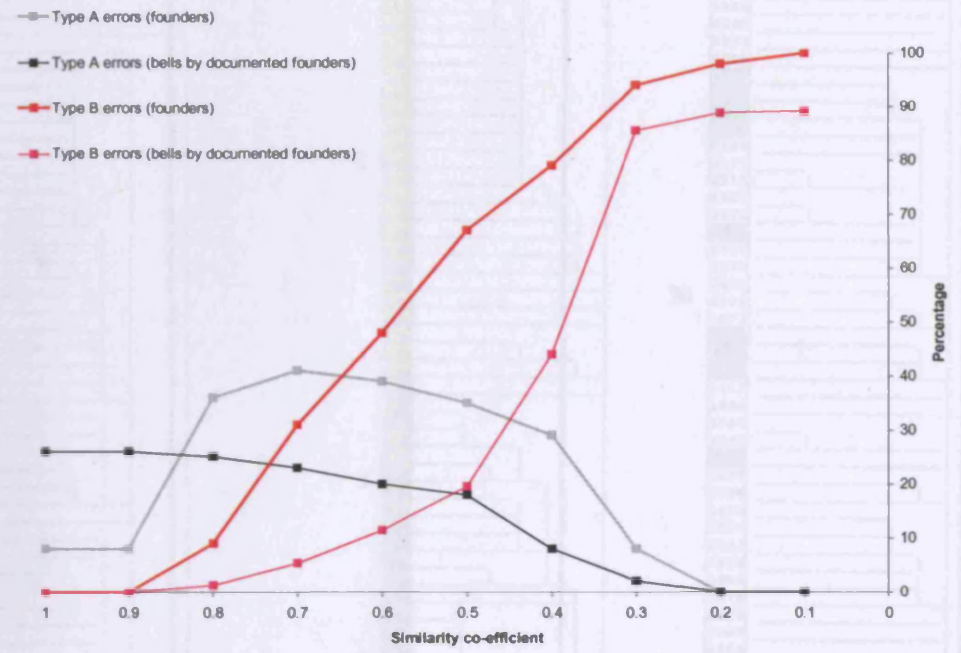


Figure 42: combined Types A and B error relating to documented bellfounders for partitions at each level of similarity in the single-link cluster analysis of units (for the definition and methods of calculating this estimate see text)

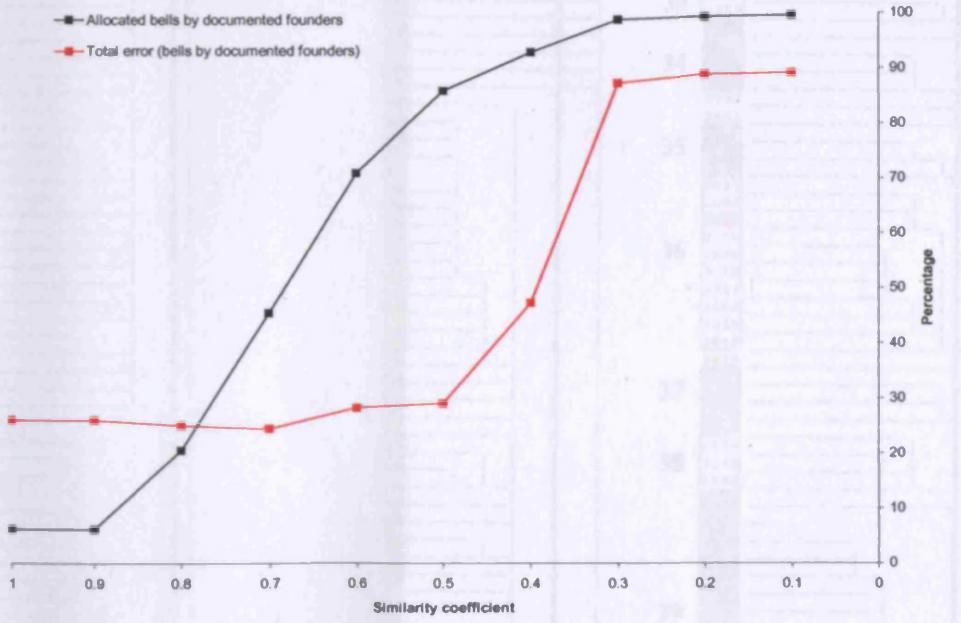


Figure 43: Single-link cluster analysis of units (partition at a similarity level of 0.5)

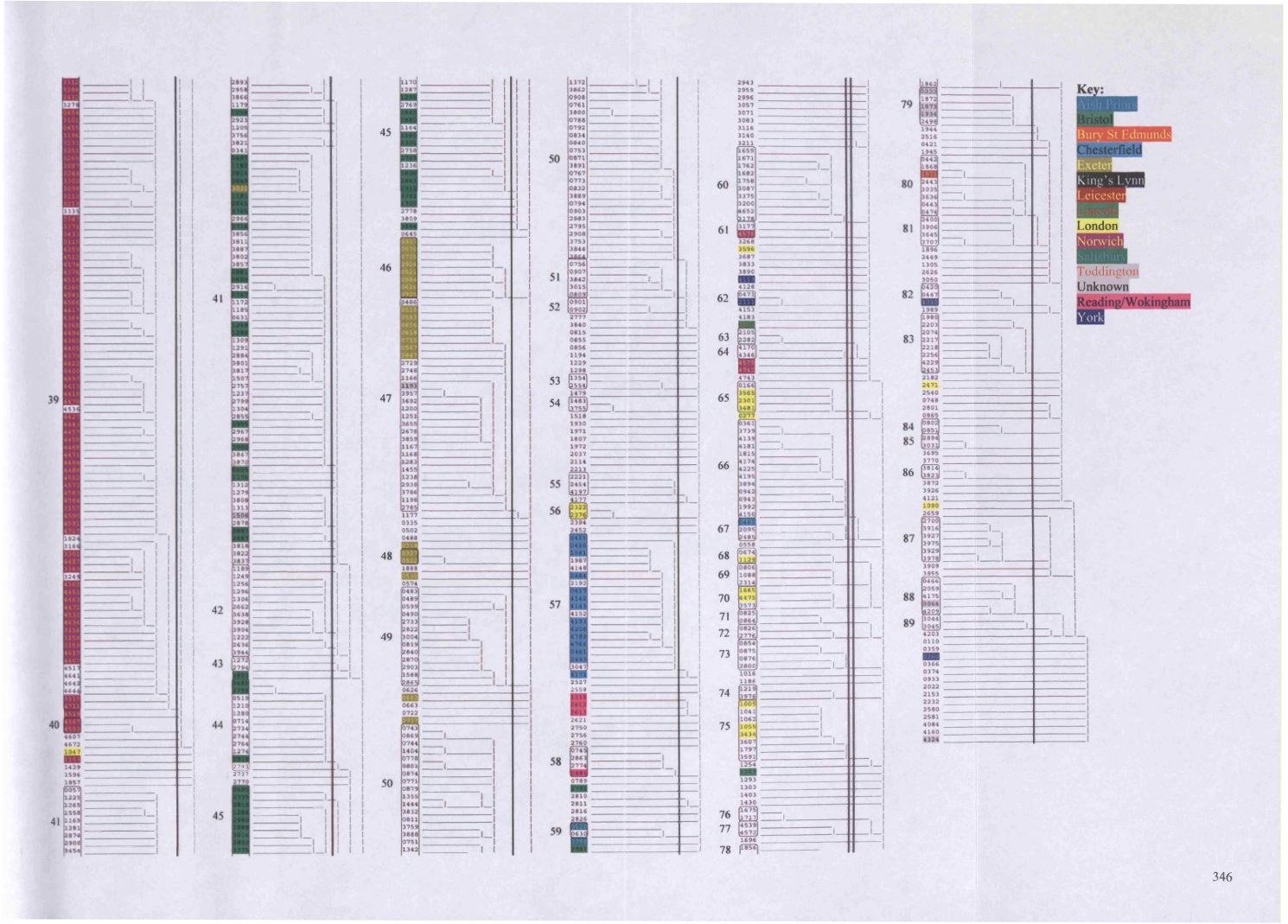

Key:
Irish Priors
Bristol
Bury St Edmunds
Chesterfield
Exeter
King's Lynn
Leicester
Lincoln
London
Norwich
Salisbury
Toddington
Unknown
Reading/Wokingham
York

Figure 44: percentage error relating to documented foundries of partitions at each level of similarity for the single-link cluster analysis of units (for the definition and methods of calculating estimates of Type A and Type B error see text)

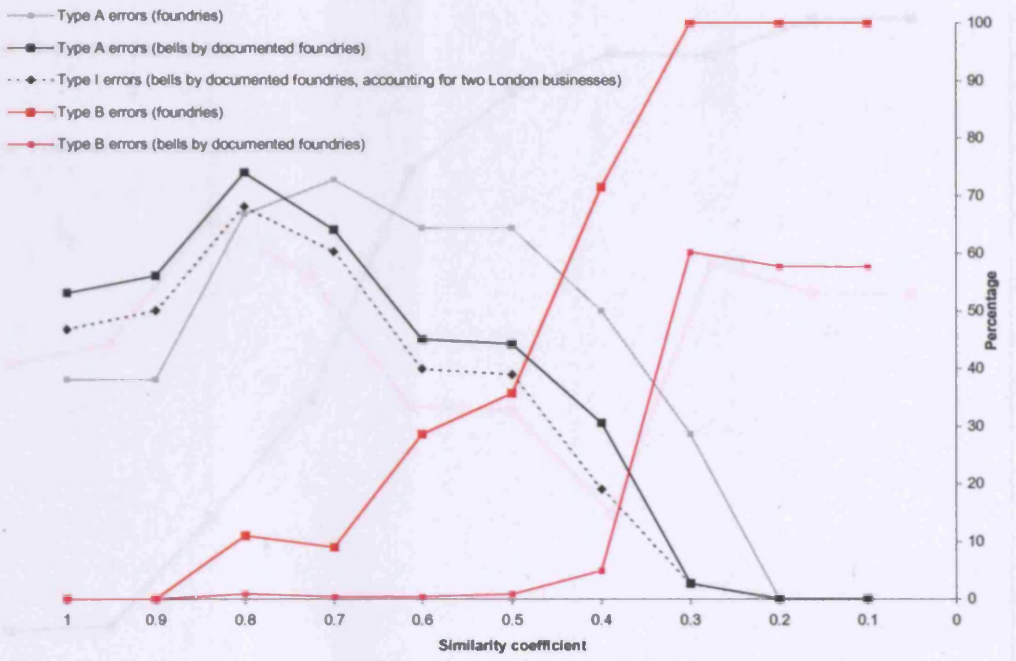


Figure 45: Documented founders of bells contained in clusters 1 (mauve) and 3 (yellow) of the partition of the single-link cluster analysis of units at a similarity coefficient of 0.4 (see Fig 47)

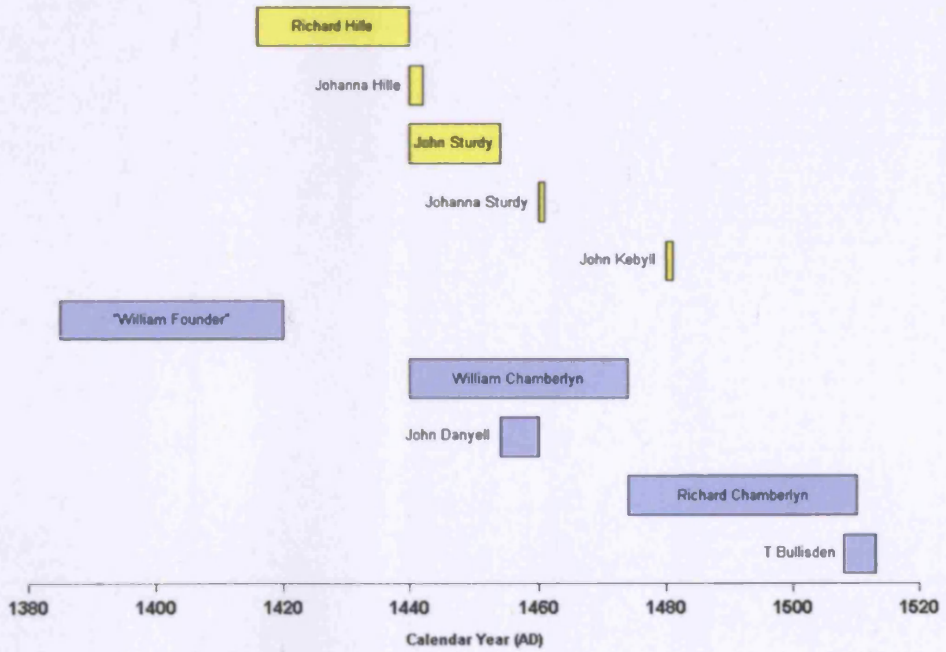


Figure 46: combined Types A and B error relating to documented foundries for partitions at each level of similarity in the single-link cluster analysis of units (for the definition and methods of calculating this estimate see text)

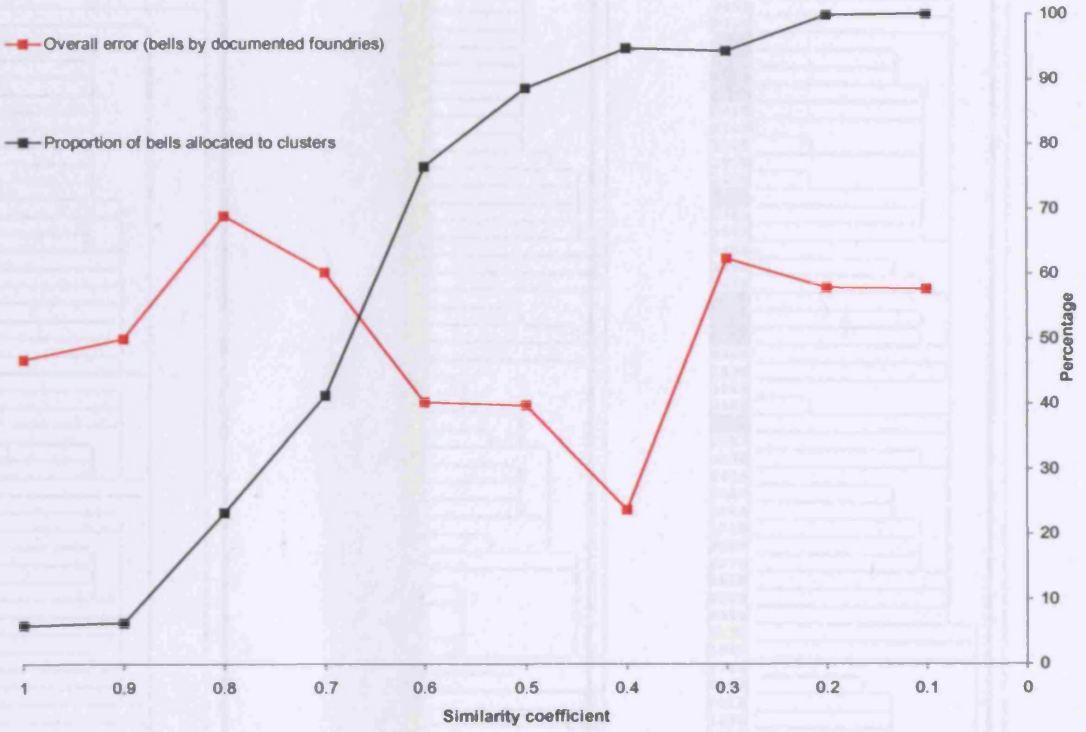


Figure 47: Single-link cluster analysis of units (partition at a similarity level of 0.4)

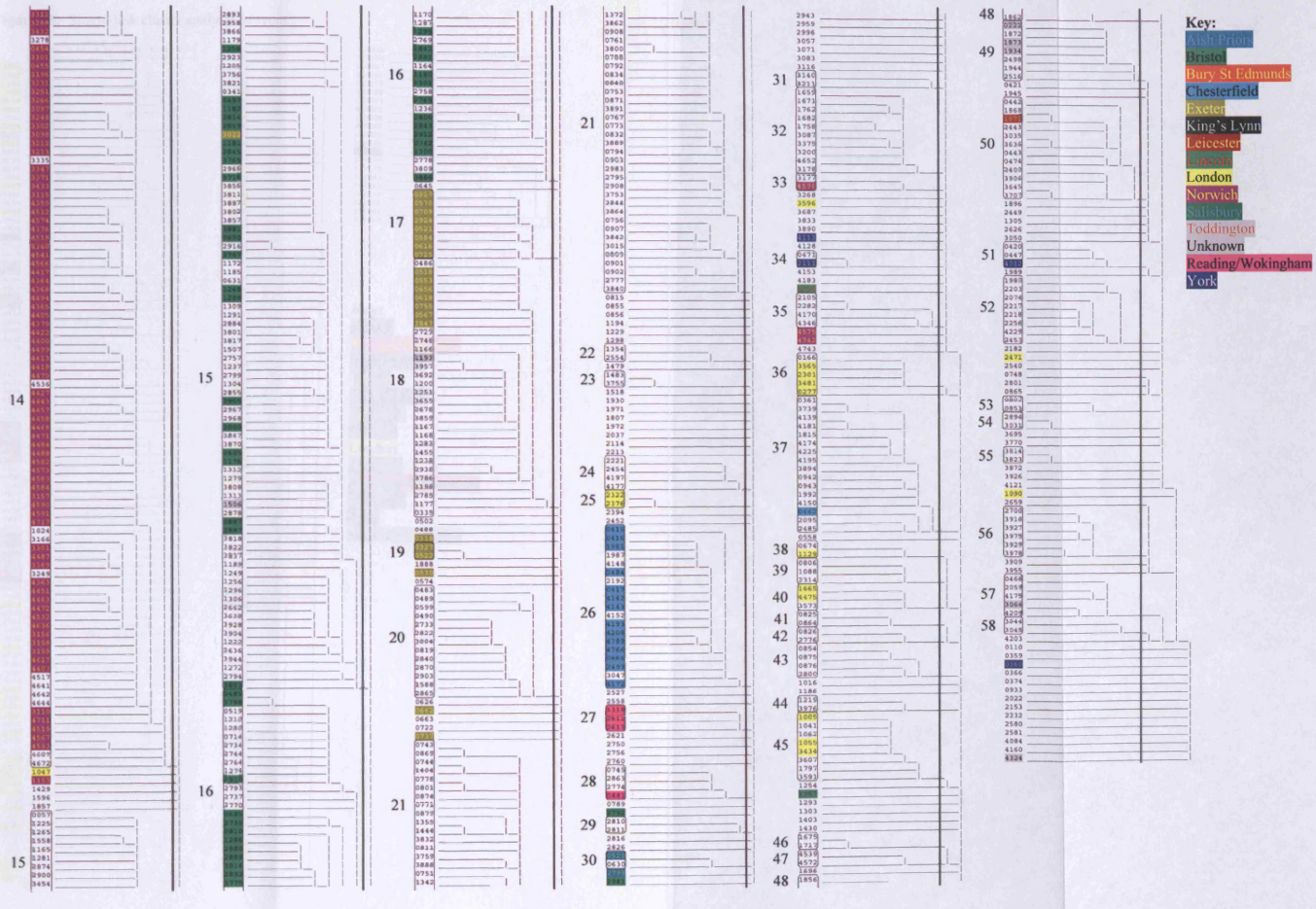

Key:
Alsh Priors
Bristol
Bury St Edmunds
Chesterfield
Exeter
King's Lynn
Leicester
Lincoln
London
Norwich
Salisbury
Toddington
Unknown
Reading/Wokingham
York

Figure 48: Single-link cluster analysis of types (overall dendrogram)

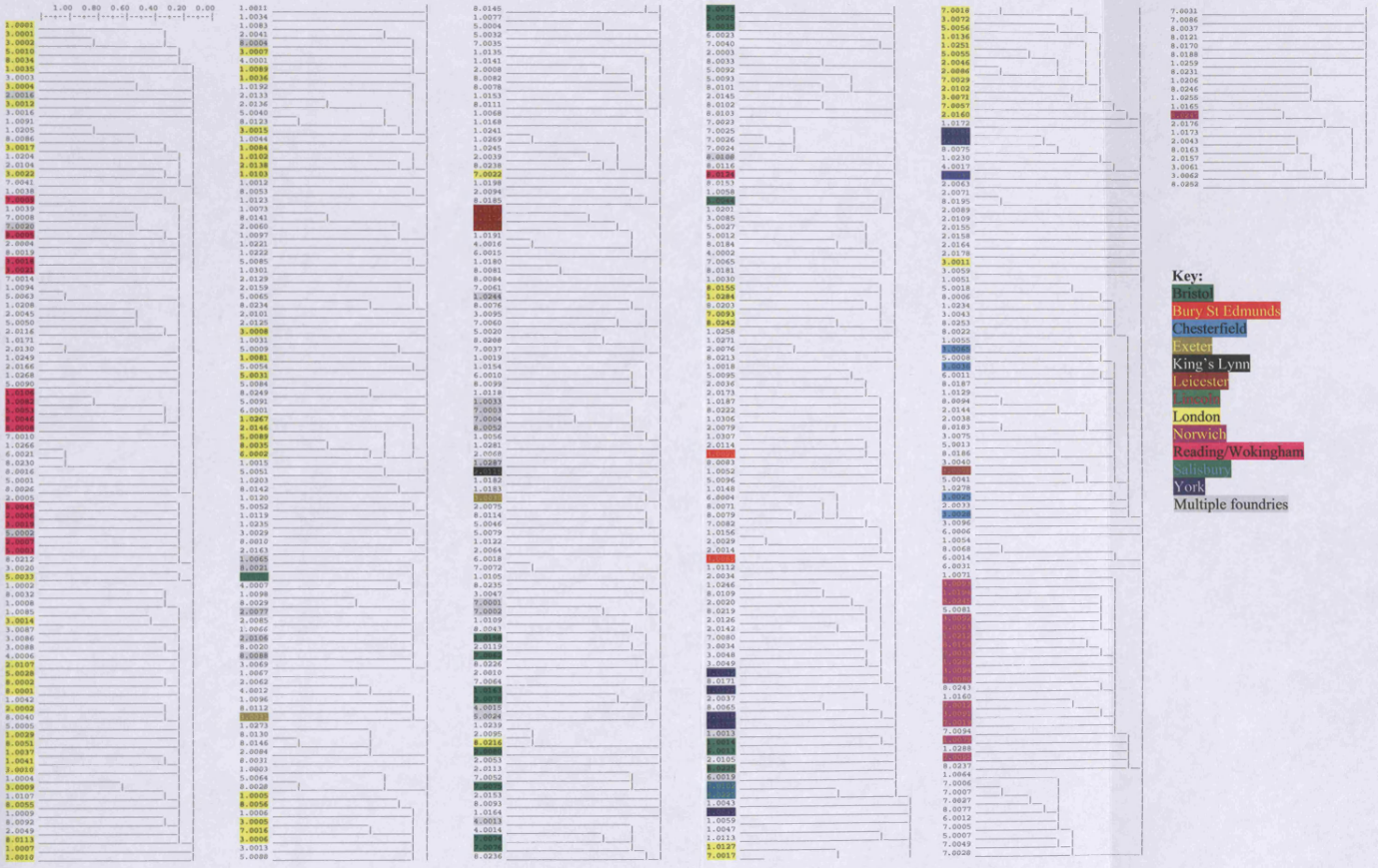


Figure 49: number of clusters formed by partitions of the single-link cluster analysis of types at different levels of similarity

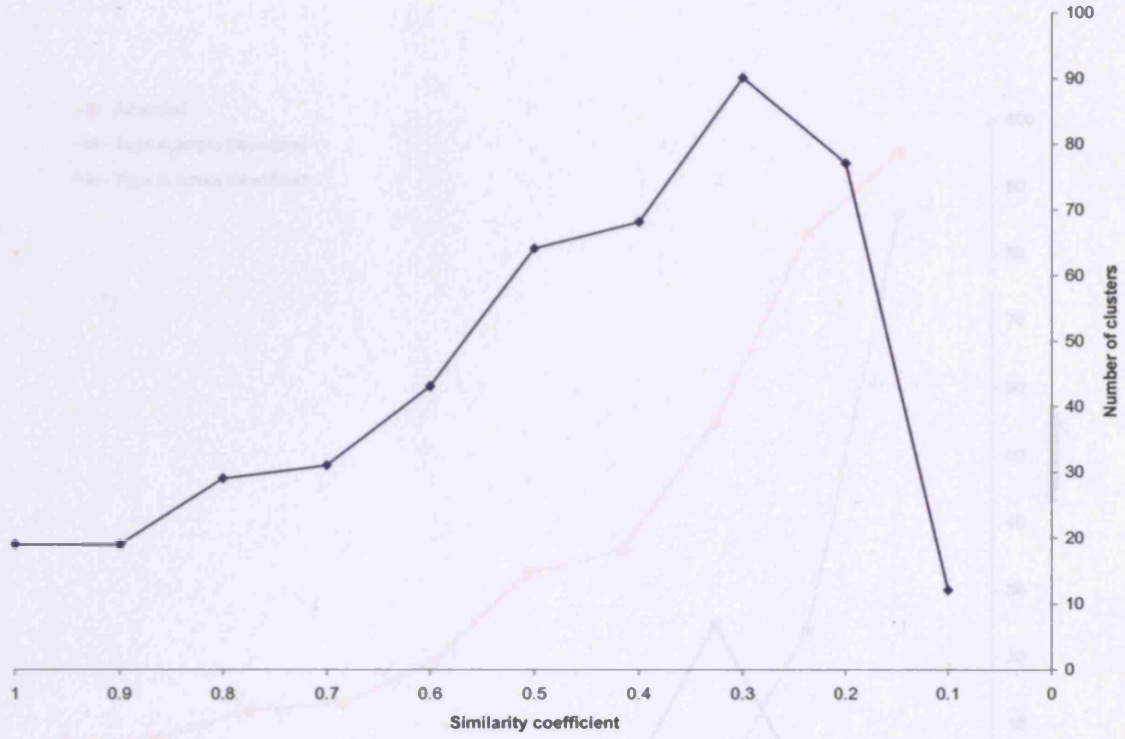


Figure 50: number of types allocated to clusters by partitions of the single-link cluster analysis of types at different levels of similarity

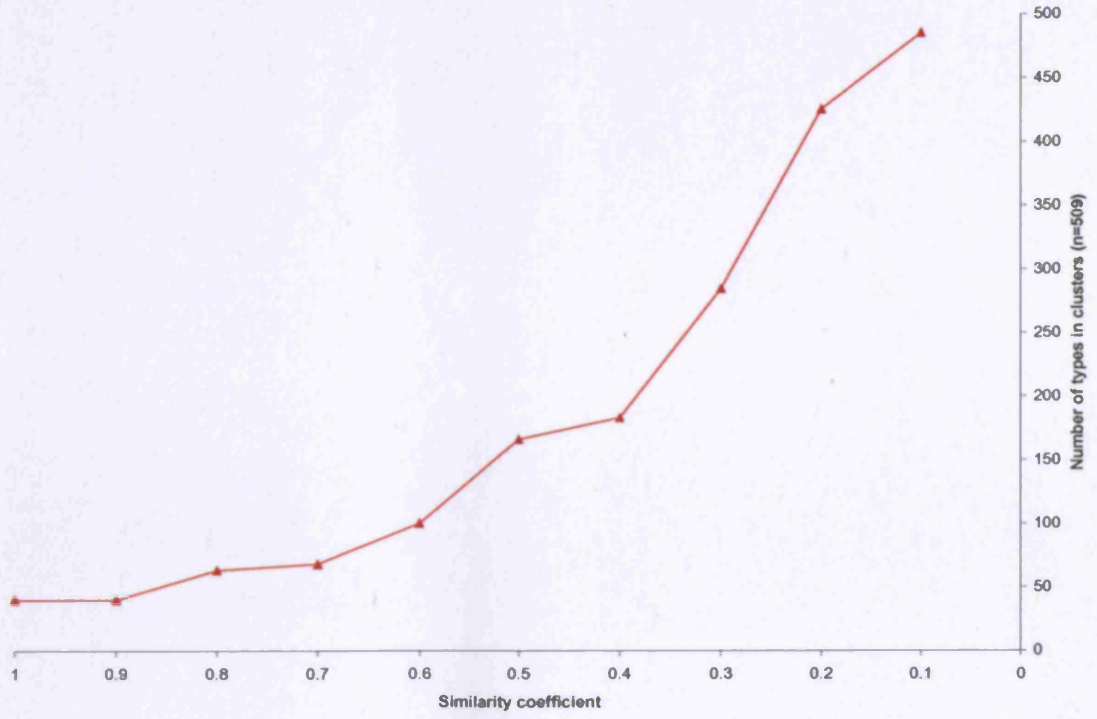


Figure 51: percentage error relating to documented founders of partitions at each level of similarity for the single-link cluster analysis of types (for the definition and methods of calculating estimates of Type A and Type B error see text)

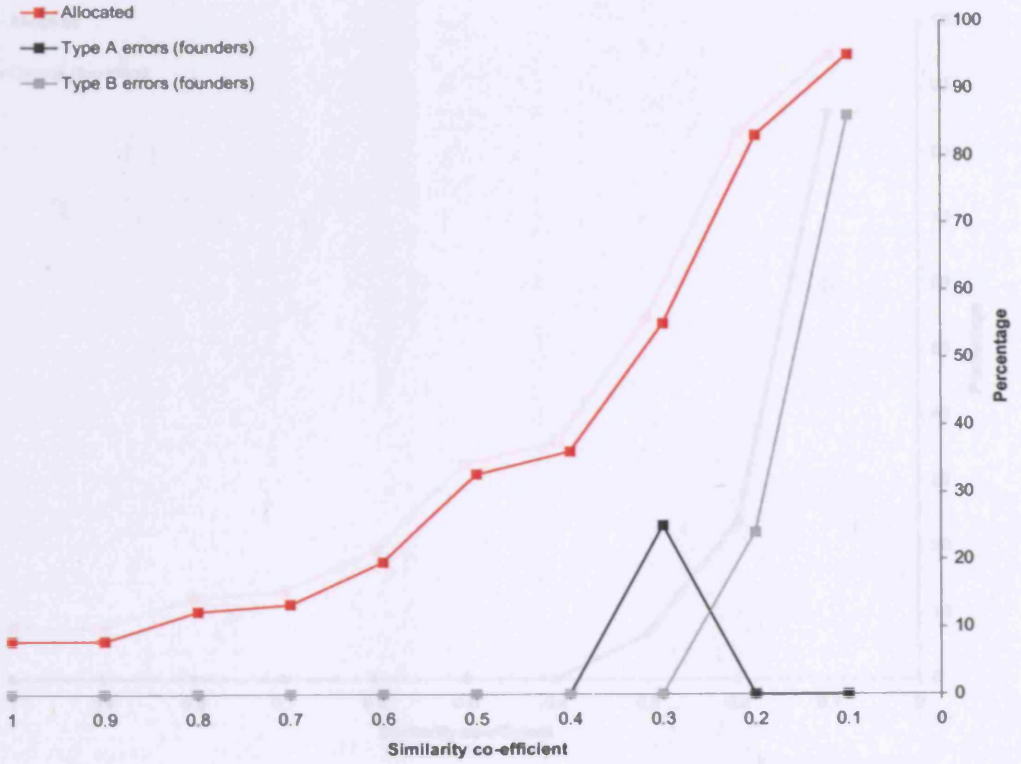


Figure 52: combined Types A and B error relating to the trademarks of documented bellfounders for partitions at each level of similarity in the single-link cluster analysis of types (for the definition and methods of calculating this estimate see text)

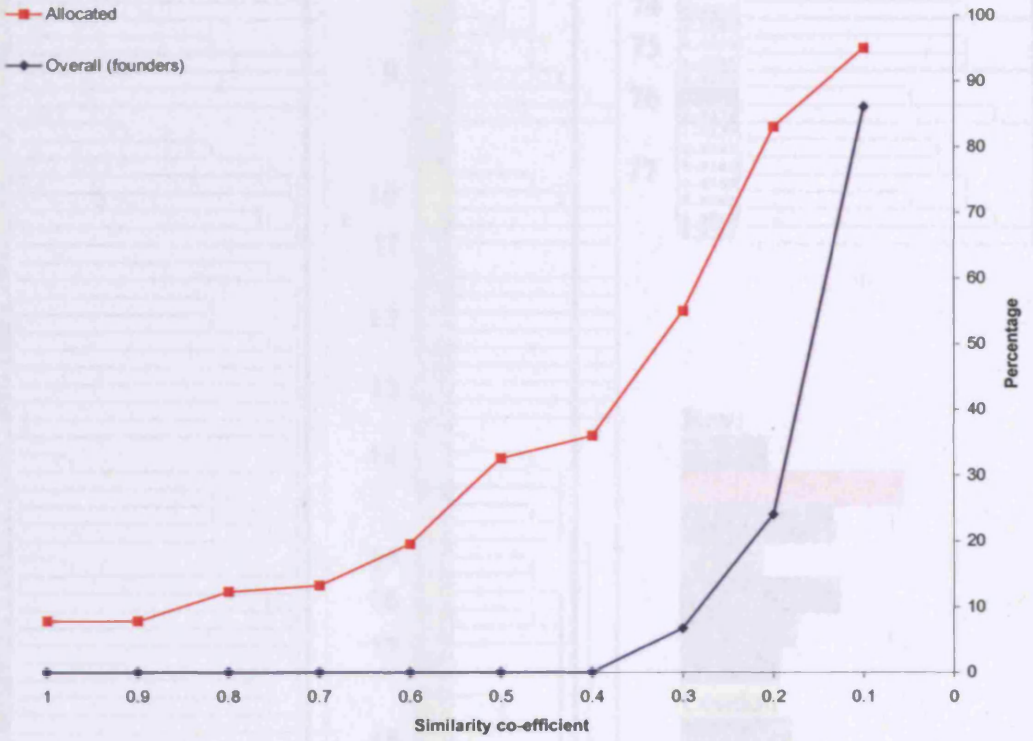


Figure 53: Single-link cluster analysis of types (partition at a similarity level of 0.2)

Figure 54: percentage error relating to documented foundries of partitions at each level of similarity for the single-link cluster analysis of types (for the definition and methods of calculating estimates of Type A and Type B error see text)

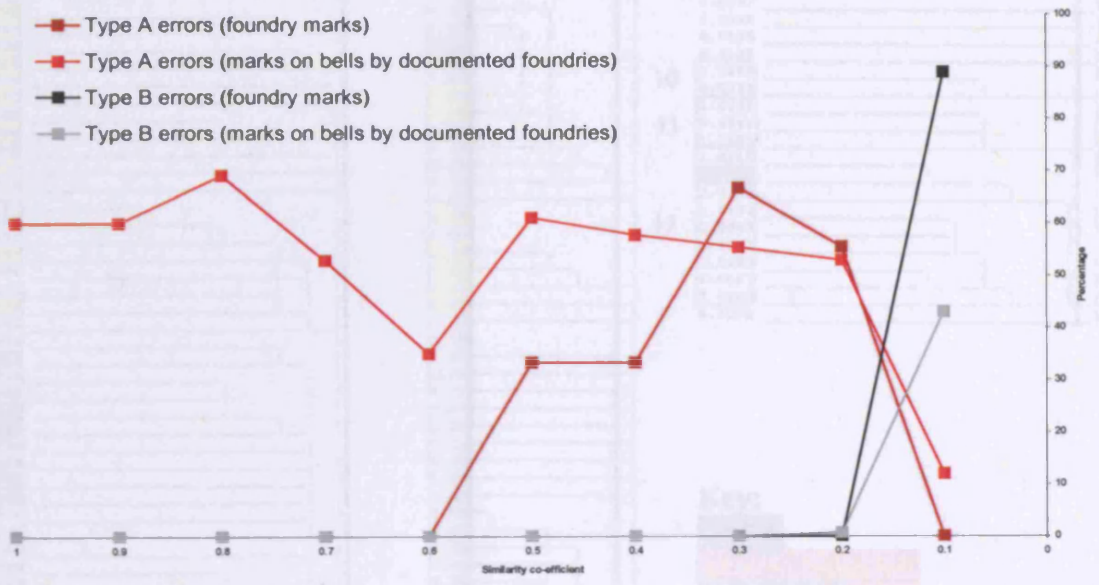


Figure 55: Single-link cluster analysis of types (partition at a similarity level of 0.1)

Figure 56: combined Types A and B error relating to marks used by documented foundries for partitions at each level of similarity in the single-link cluster analysis of types (for the definition and methods of calculating this estimate see text)

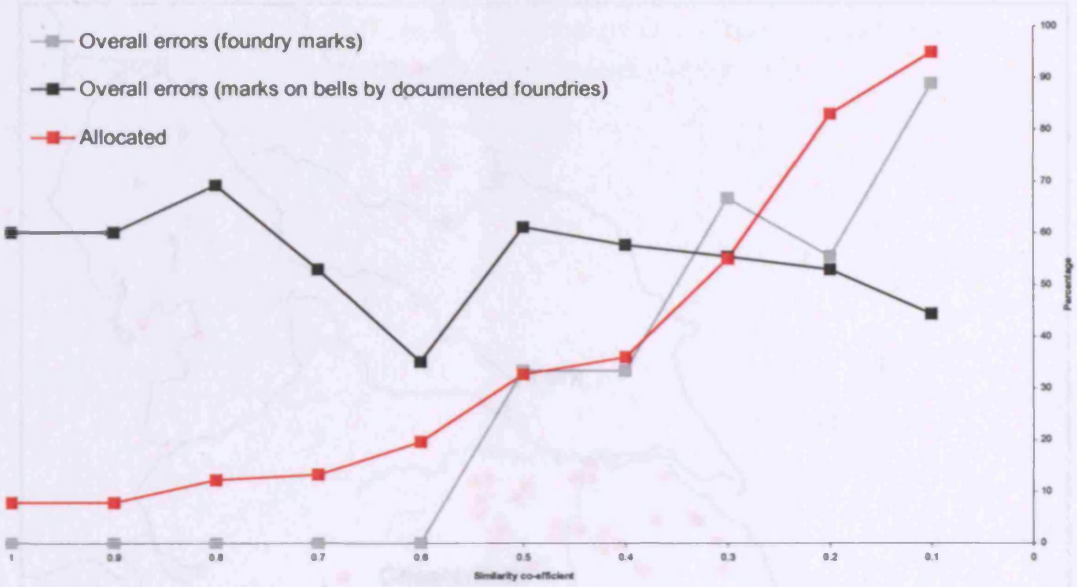


Figure 57: location map of bells included in cluster 21 of the single-link cluster analysis of units from the partition at a similarity level of 0.4 (bells identical to those in the reduced incidence matrix, included from the complete incidence matrix)

Figure 58: single-link cluster analysis of units, cluster 9 of the partition at a similarity level of 0.4 (bells indentical to those in the reduced incidence matrix, included from the complete incidence matrix)

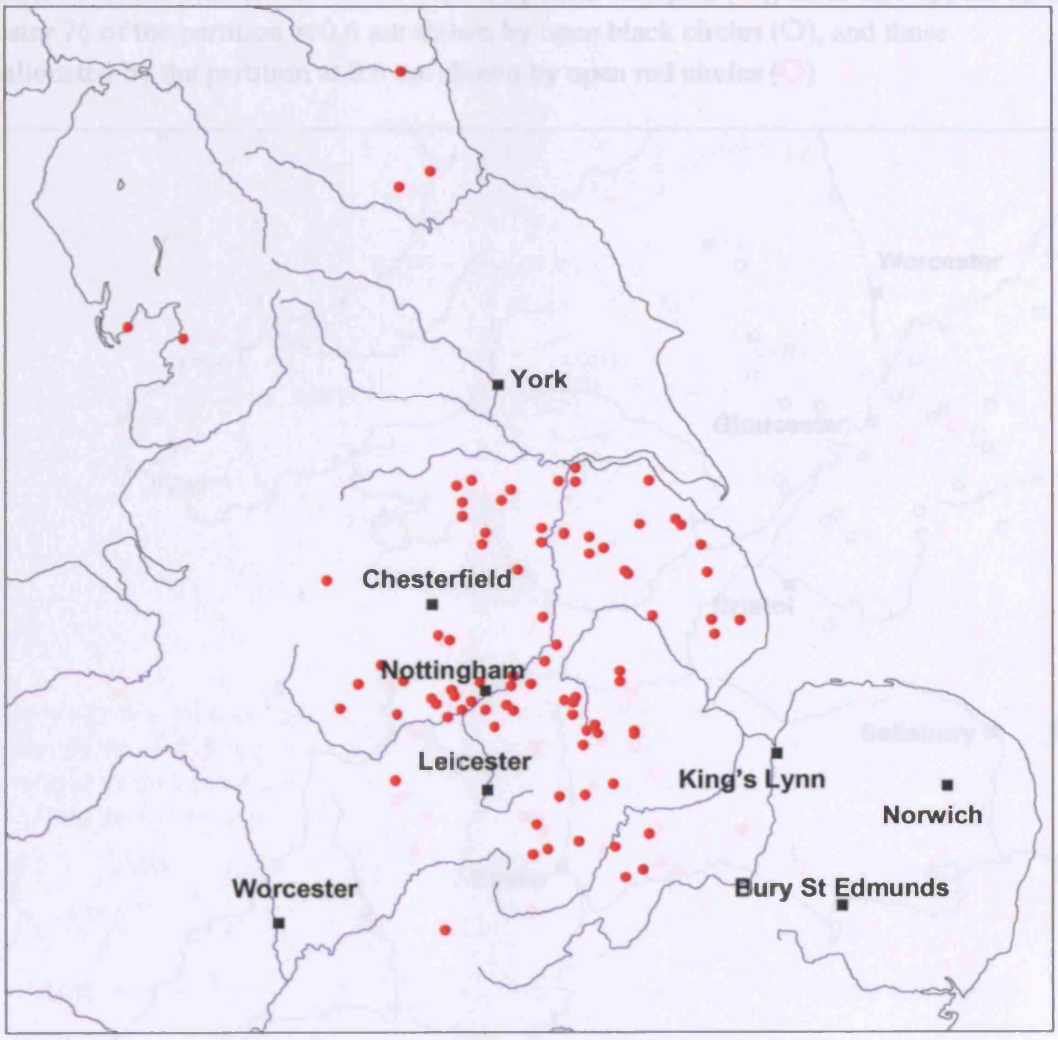


Figure 59: single-link cluster analysis of units, cluster 18 of the partition at a similarity level of 0.4 (bells indentical to those in the reduced incidence matrix, included from the complete incidence matrix). Those bells appearing in this cluster which also occur in cluster 75 of the partition at 0.6 are shown by solid red spots (●), those also appearing in cluster 76 of the partition at 0.6 are shown by open black circles (○), and those unallocated by the partition at 0.6 are shown by open red circles (○)

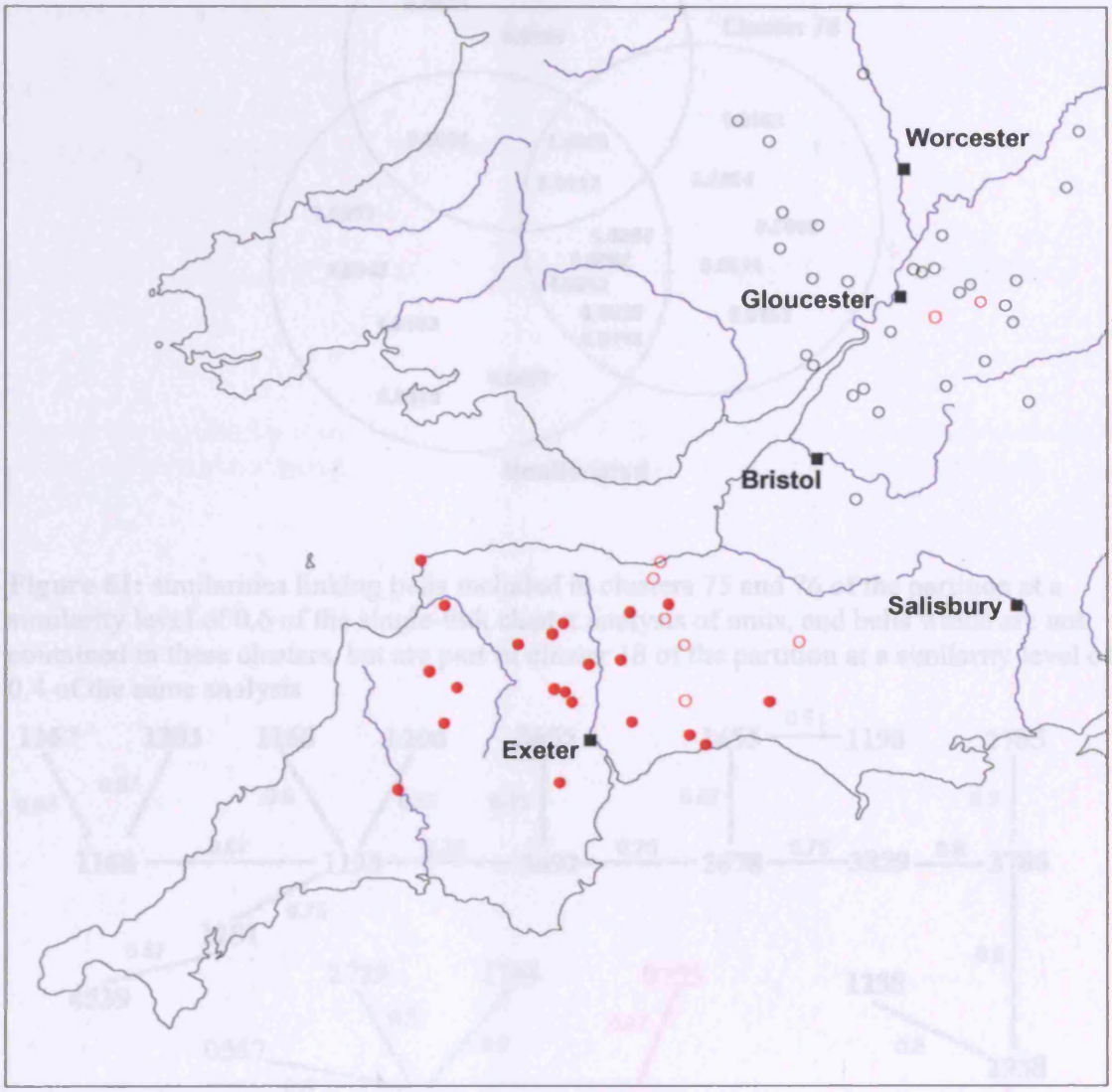


Figure 60: Venn diagram showing stamps which occur on bells included in clusters 75 and 76 of the partition at a similarity level of 0.6 of the single-link cluster analysis of units, and stamps which appear on bells not contained in these clusters, but part of cluster 18 of the partition at a similarity level of 0.4 of the same analysis

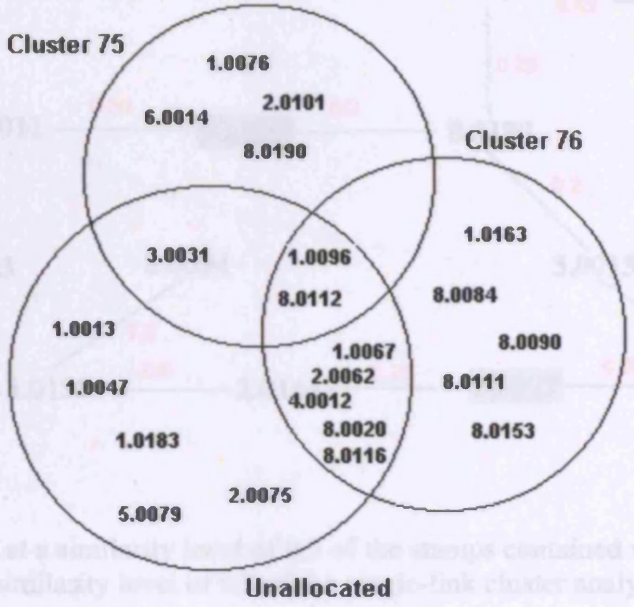


Figure 61: similarities linking bells included in clusters 75 and 76 of the partition at a similarity level of 0.6 of the single-link cluster analysis of units, and bells which are not contained in these clusters, but are part of cluster 18 of the partition at a similarity level of 0.4 of the same analysis

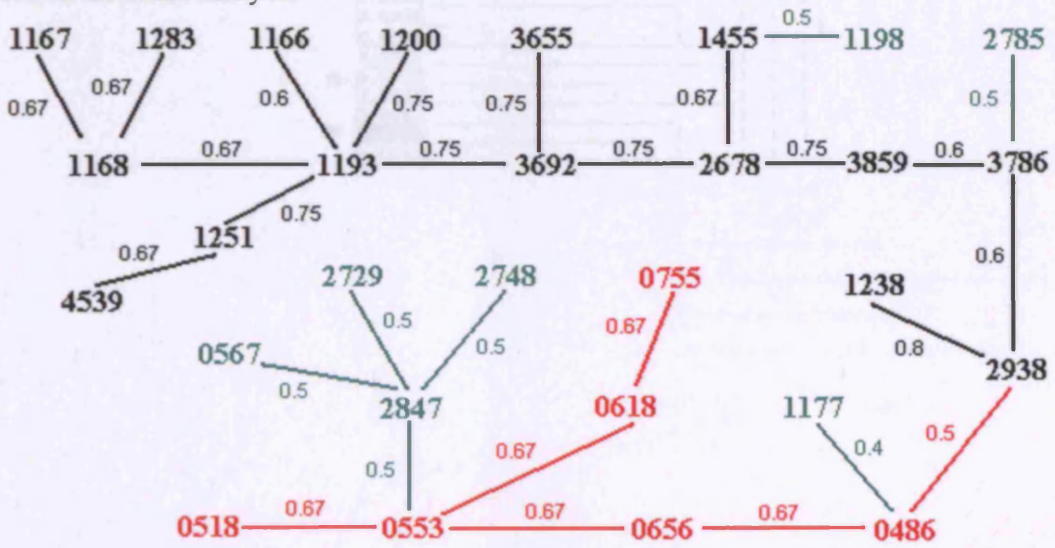


Figure 62: similarities linking stamps included in cluster 69 of the partition at a similarity level of 0.2 of the single-link cluster analysis of types

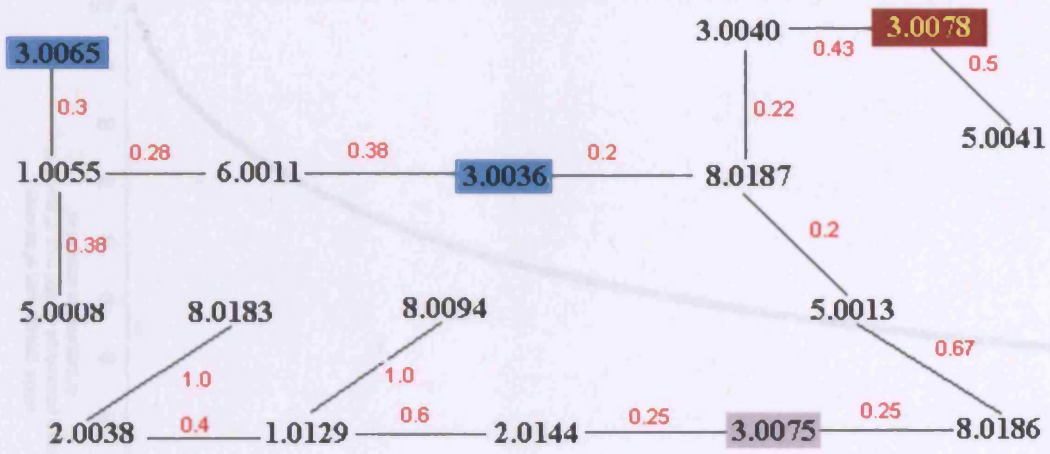


Figure 63: partition at a similarity level of 0.3 of the stamps contained within cluster 69 of the partition at a similarity level of 0.2 of the single-link cluster analysis of types

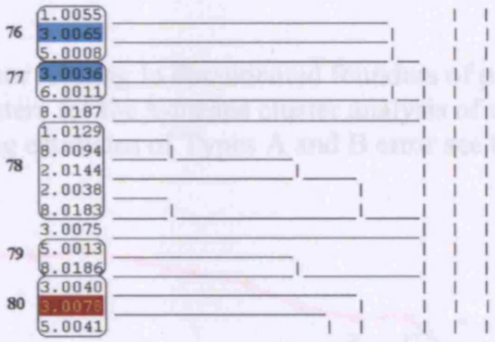


Figure 64: within groups sum of squares (as a percentage of total sum of squares) for the k-means analysis of units for successive numbers of clusters

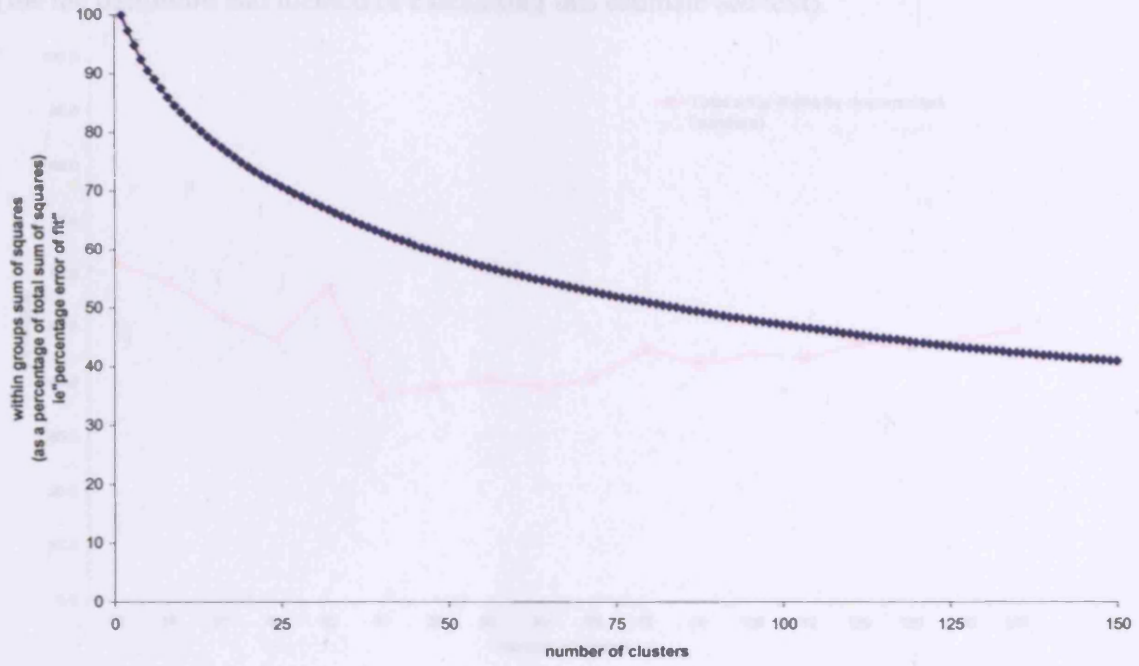


Figure 65: percentage error relating to documented founders of partitions forming increasing number of clusters for the k-means cluster analysis of units (for the definition and methods of calculating estimates of Types A and B error see text)

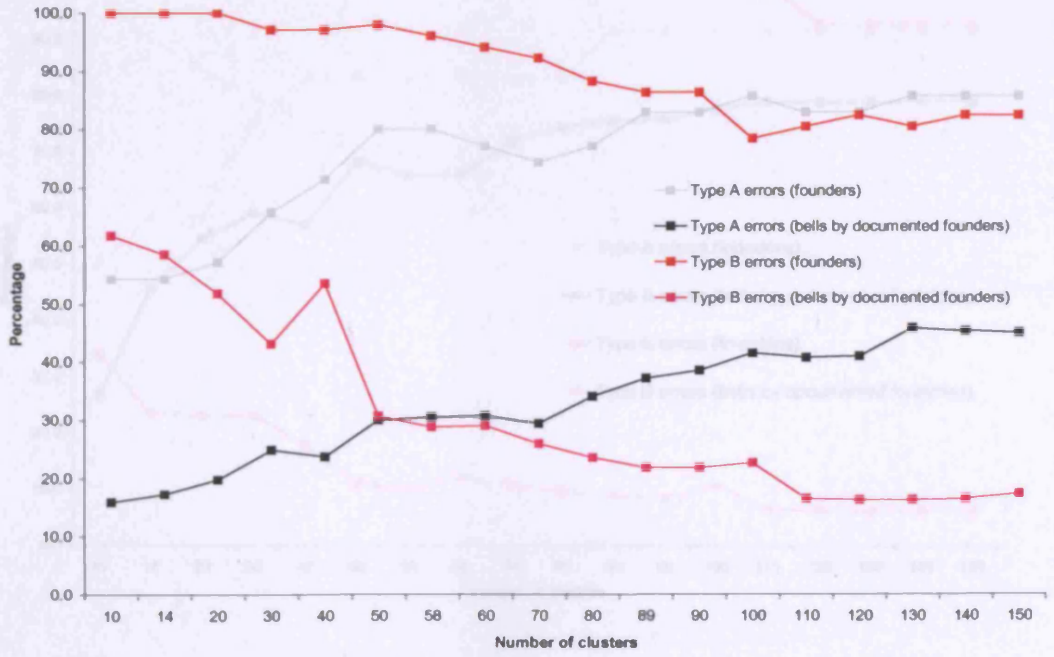


Figure 66: combined Types A and B error relating to documented bellfounders for partitions forming successive numbers of clusters in the k-means cluster analysis of units (for the definition and method of calculating this estimate see text)

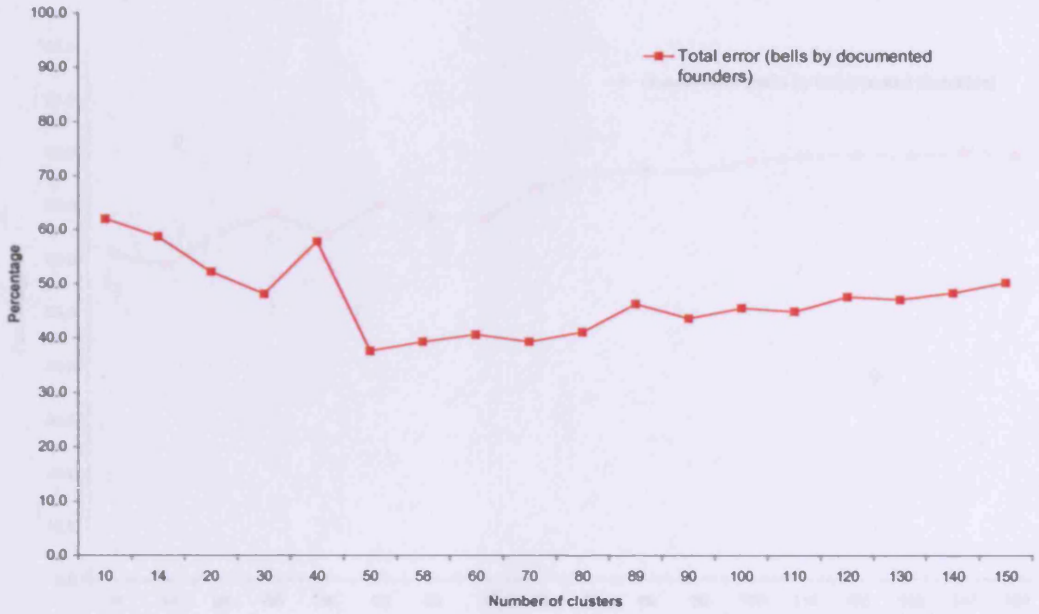


Figure 67: percentage error relating to documented foundries of partitions forming increasing number of clusters for the k-means cluster analysis of units (for the definition and methods of calculating estimates of Types A and B error see text)

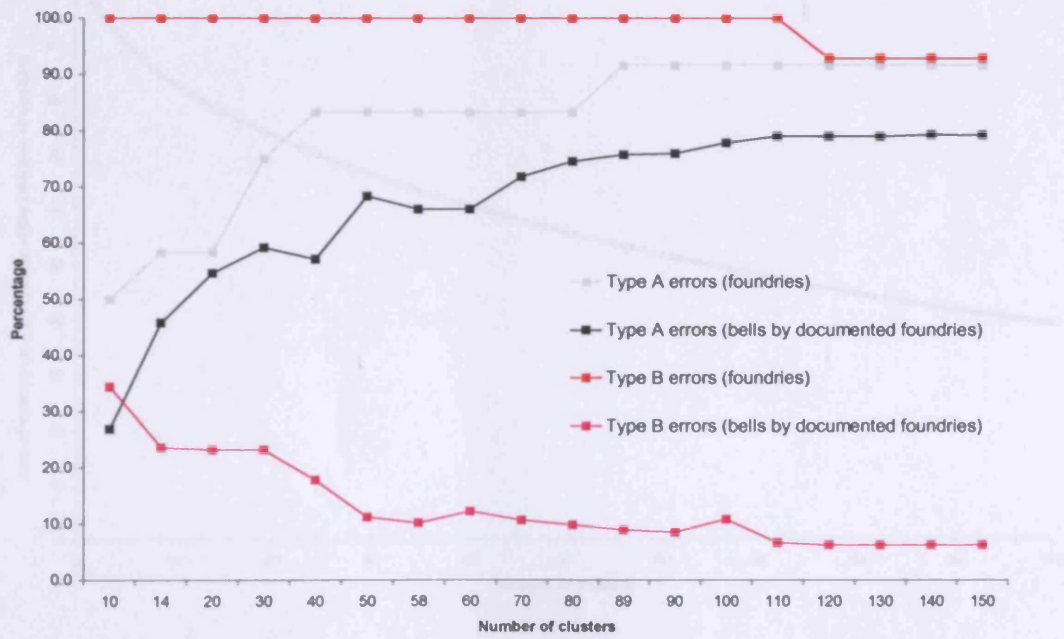


Figure 68: combined Types A and B error relating to documented bellfounders for partitions forming successive numbers of clusters in the k-means cluster analysis of units (for the definition and method of calculating this estimate see text)

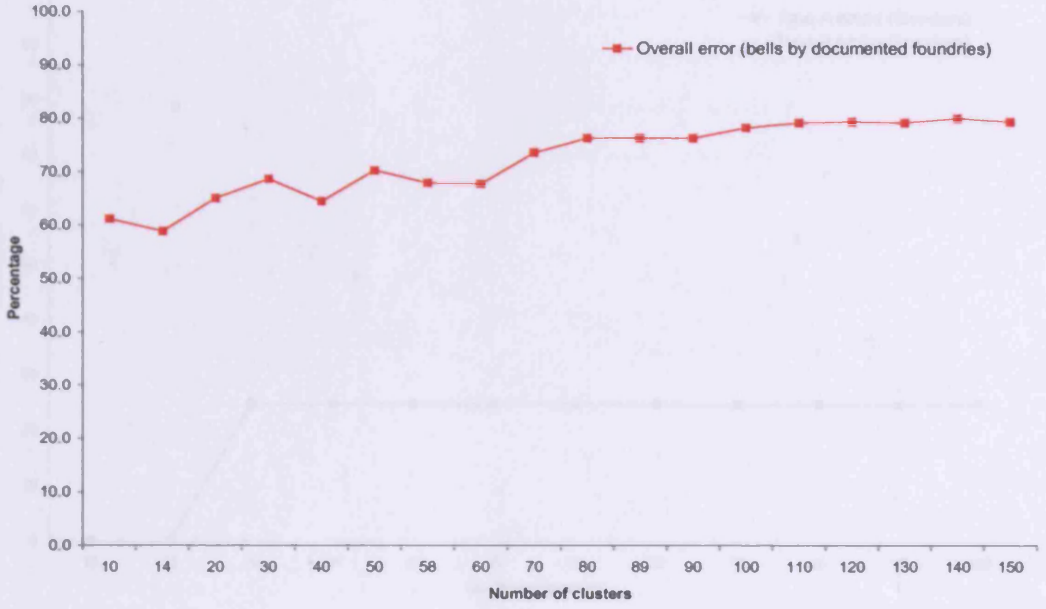


Figure 69: within groups sum of squares (as a percentage of total sum of squares) for the k-means analysis of types for successive numbers of clusters

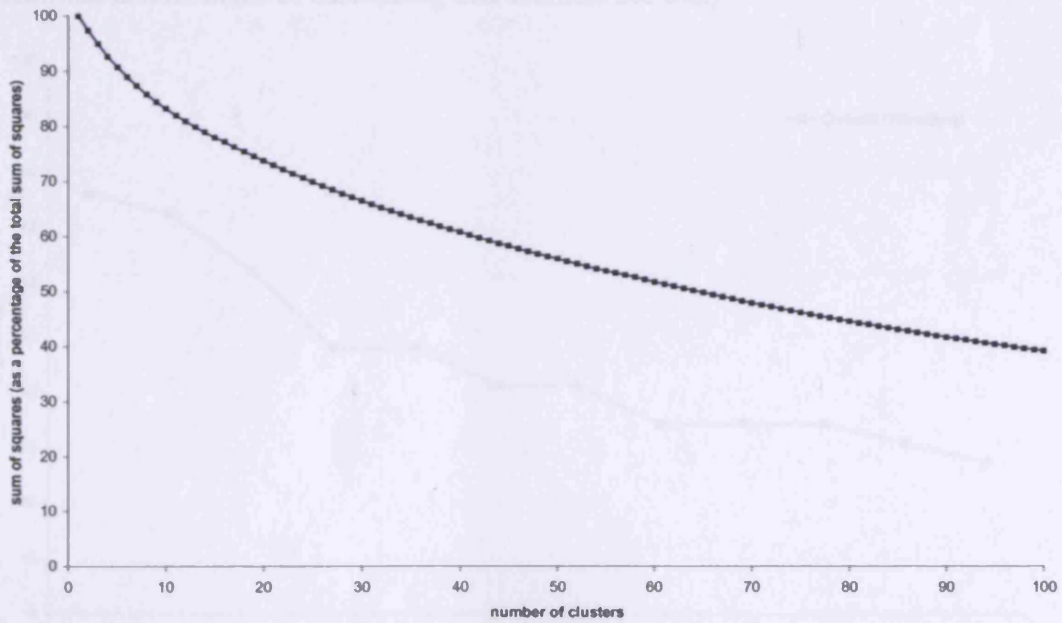


Figure 70: percentage error relating to documented founders for alternative solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of estimates of calculating Type A and Type B error see text)

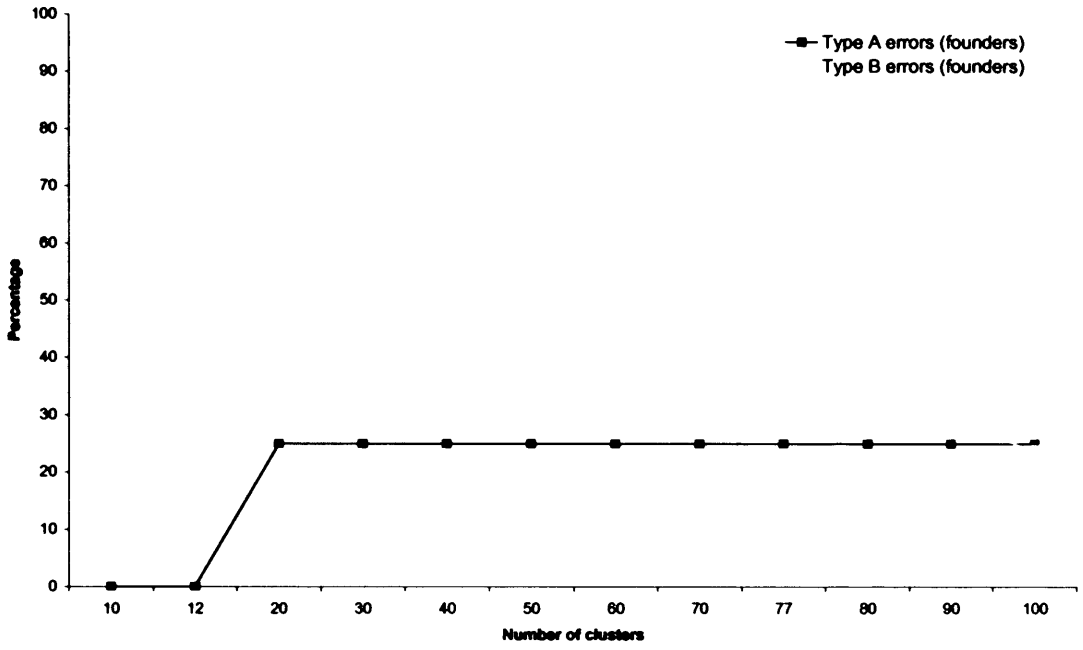


Figure 71: overall error relating to the trademarks of documented bellfounders for solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of calculating this estimate see text)

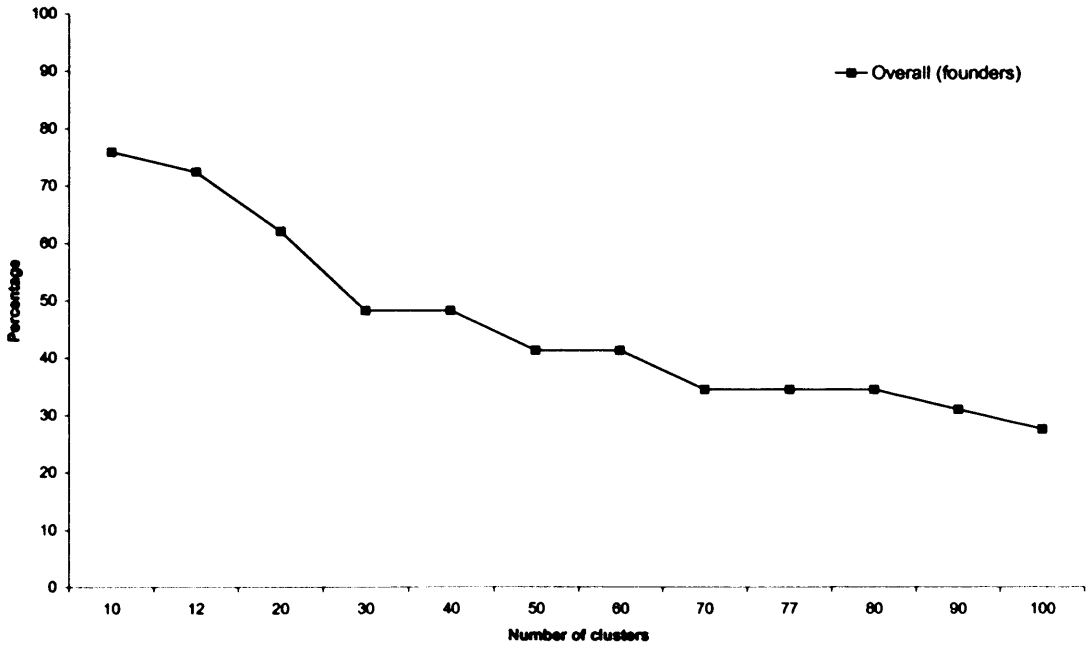


Figure 72: percentage error relating to documented foundries for alternative solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of estimates of calculating Type A and Type B error see text)

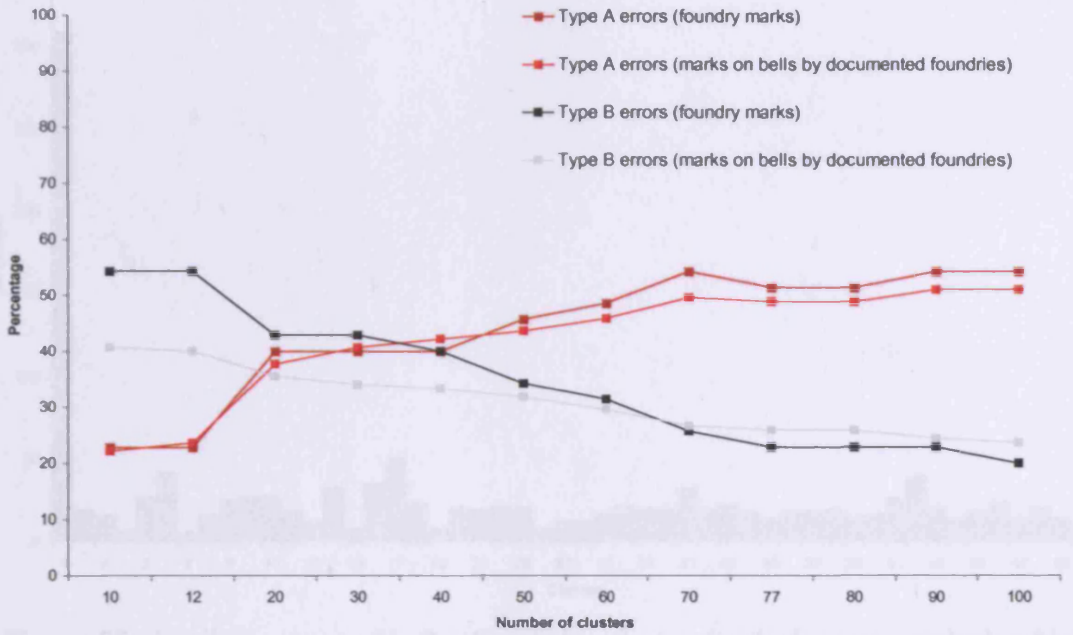


Figure 73: overall error relating to the trademarks of documented foundries for solutions of the k-means analysis of types forming increasing numbers of clusters (for the definition and methods of calculating this estimate see text)

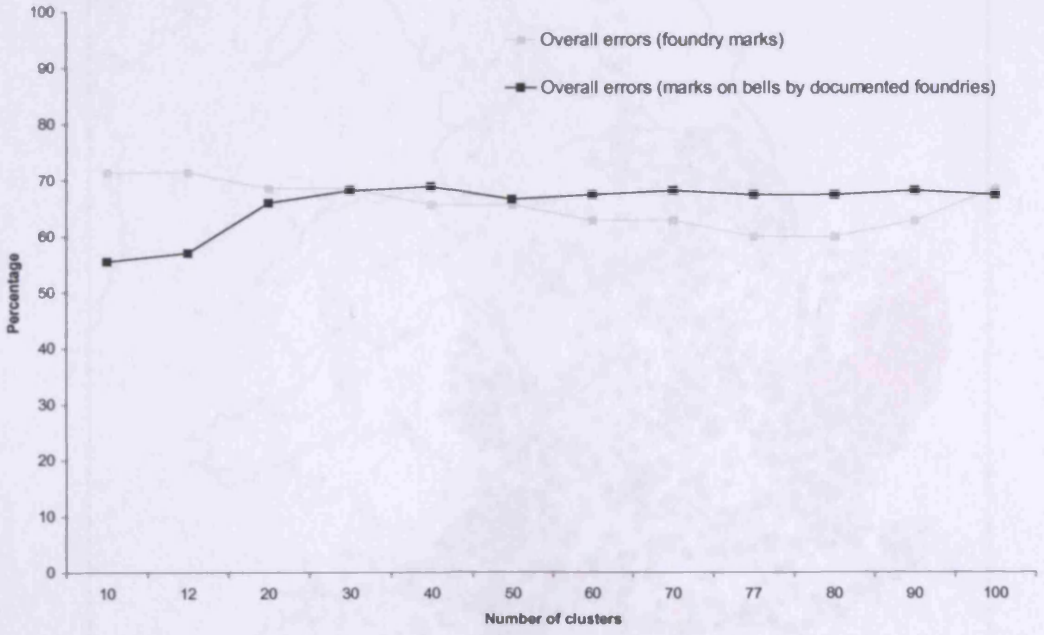


Figure 74: number of bells included in the clusters of the solution of the k-means analysis of units which produces 50 clusters

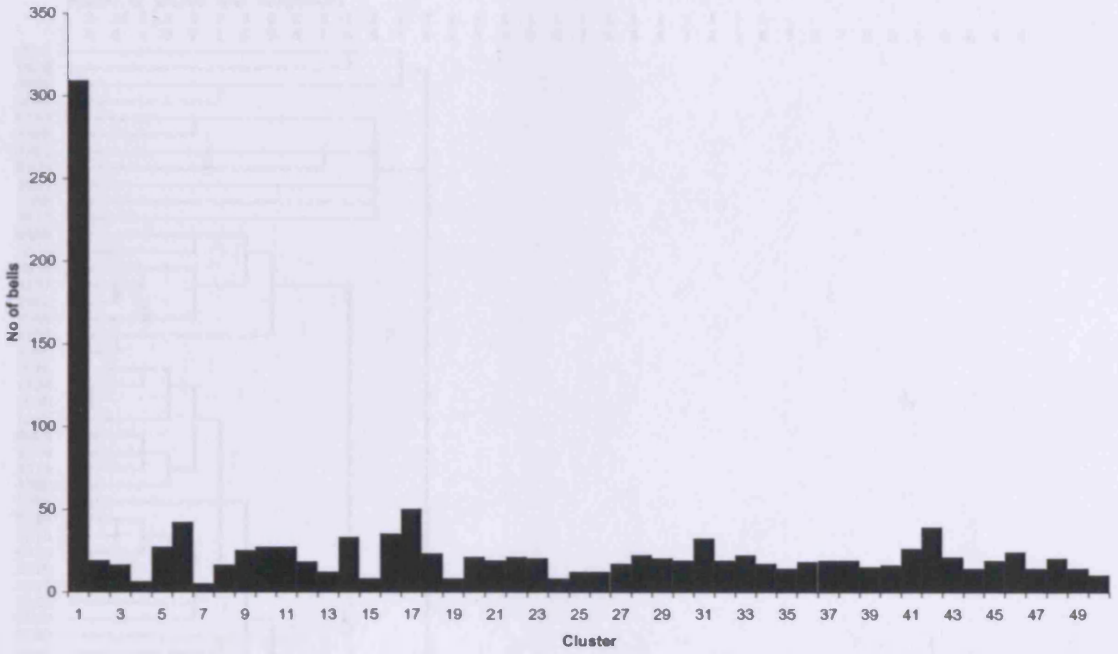


Figure 75: distribution map of bells allocated to clusters by the k-means analysis which produces 14 clusters (black = clusters 1, 2, 3, 8, 11, and 13; cyan = cluster 4; green = clusters 5 and 10; grey = cluster 6; pink = clusters 7 and 12; red = clusters 9 and 14)

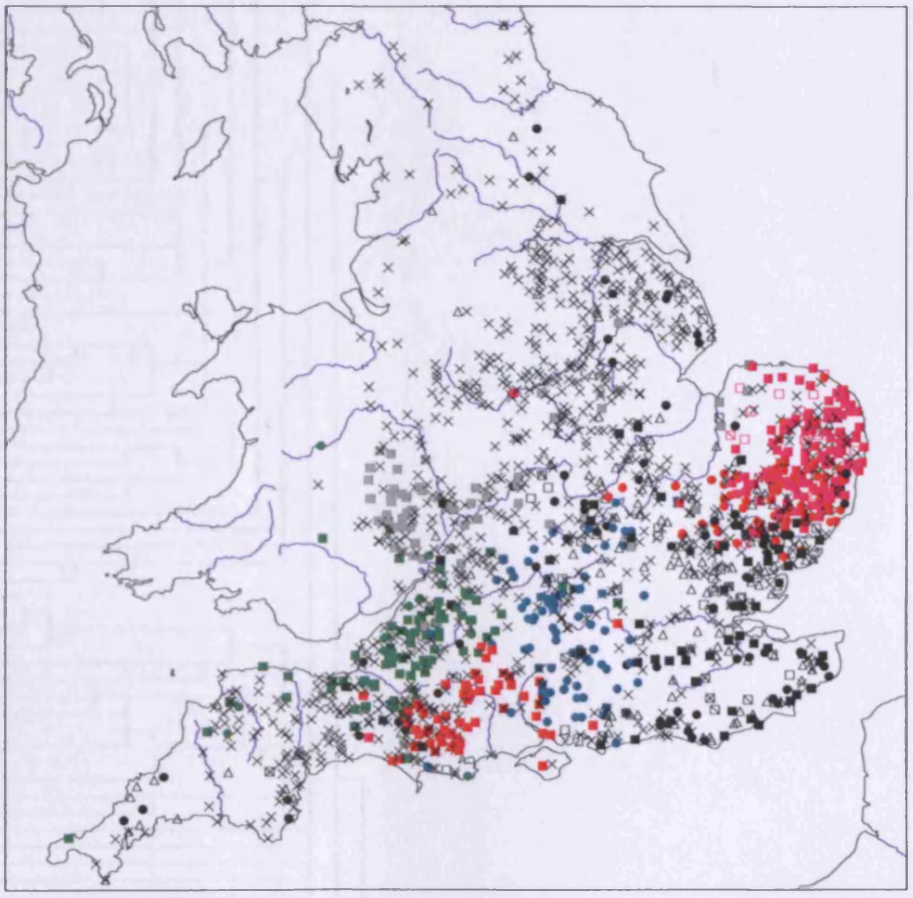
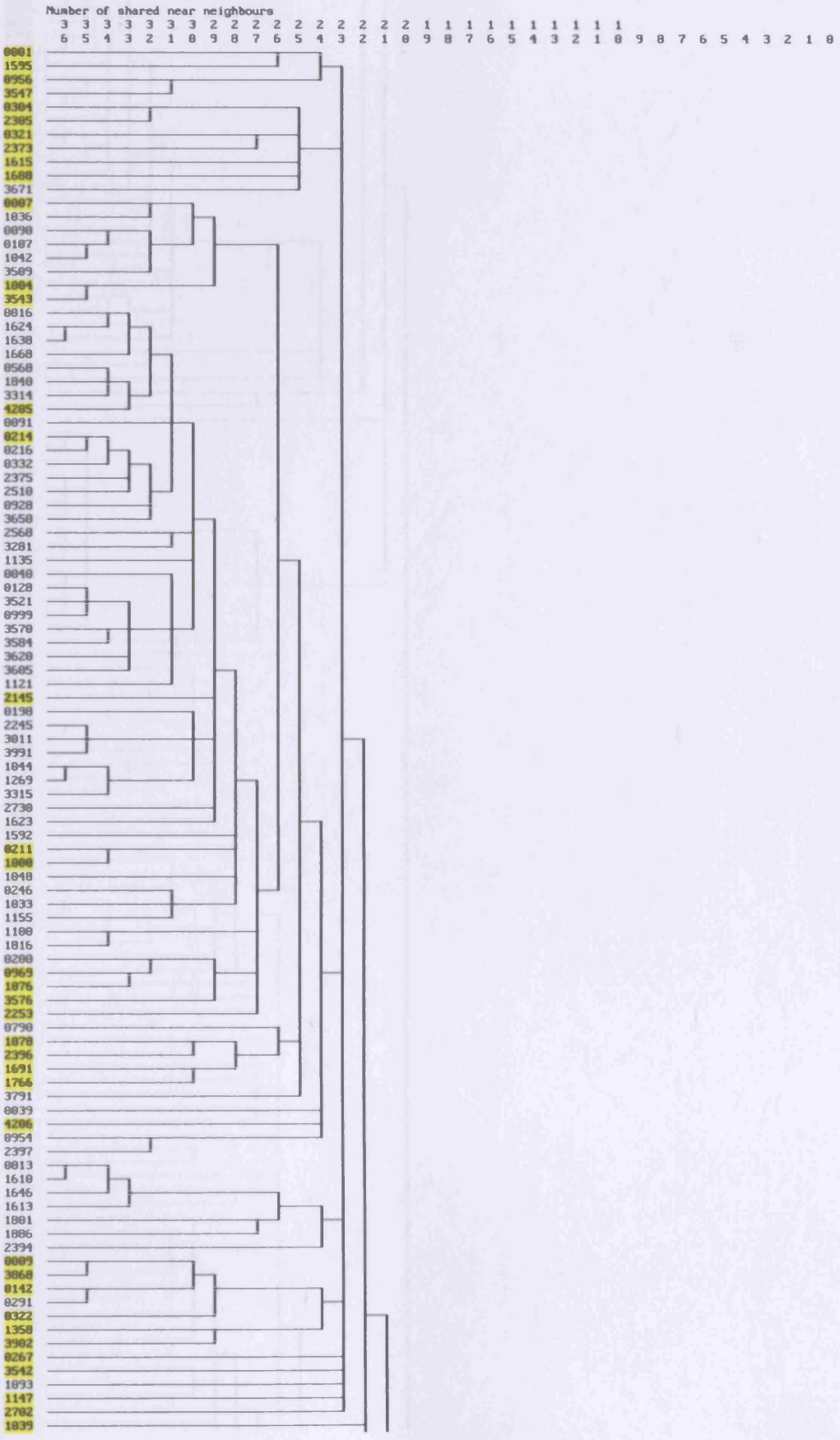
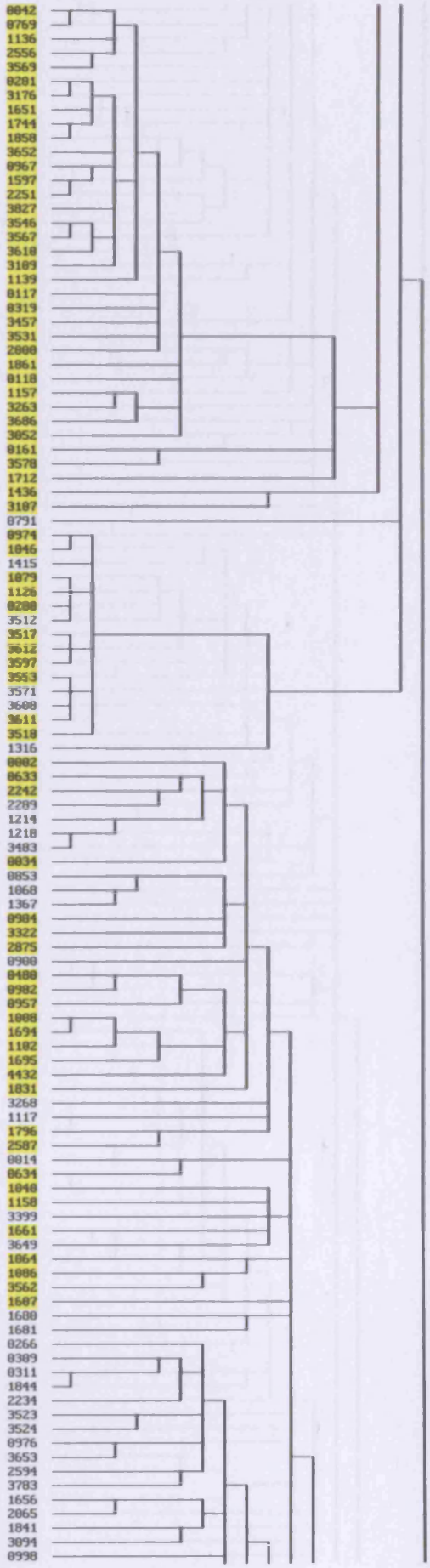
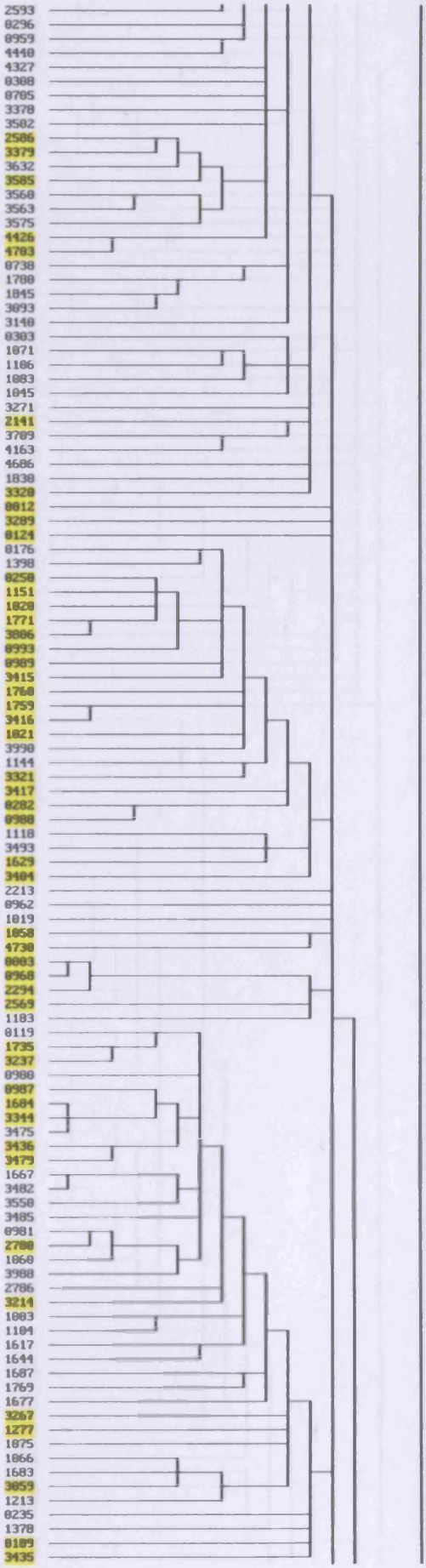
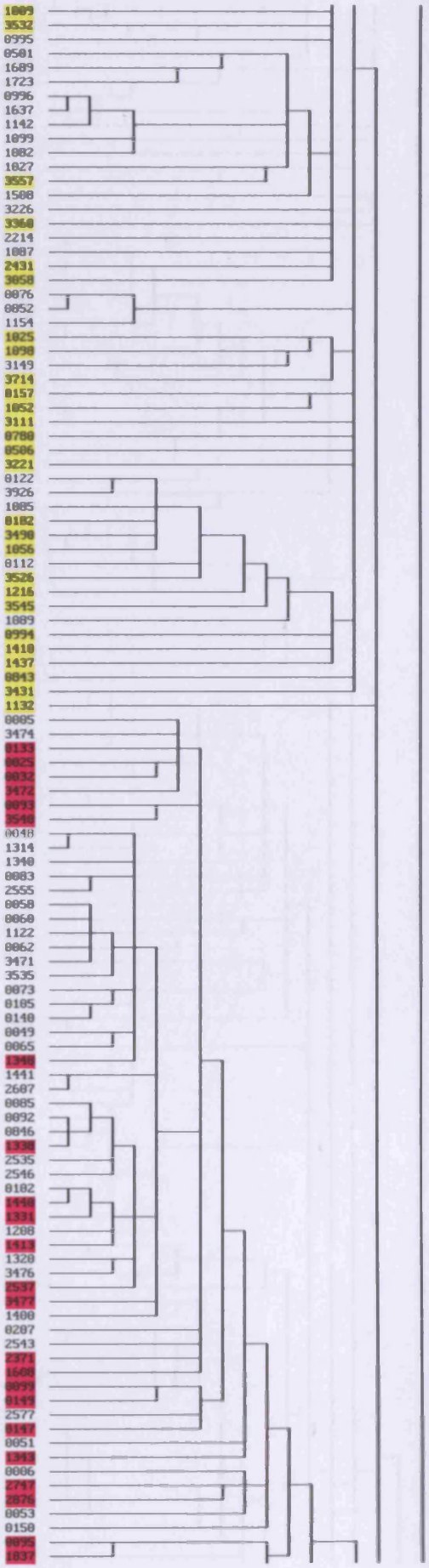


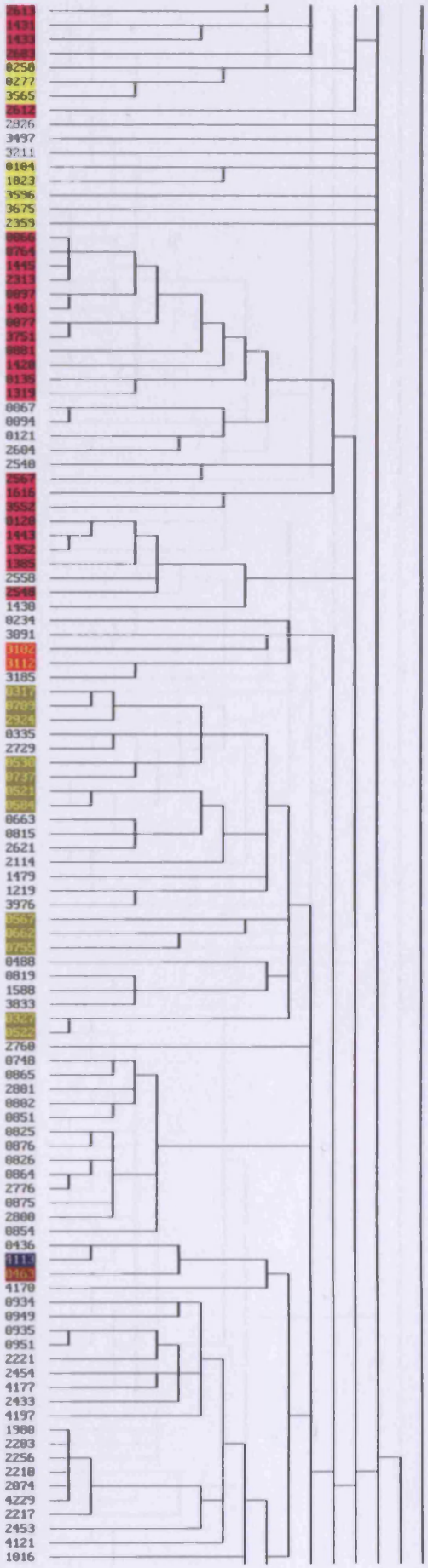
Figure 76: Shared Near Neighbour Clustering of units, using the Jaccard similarity coefficient and considering 36 near neighbours

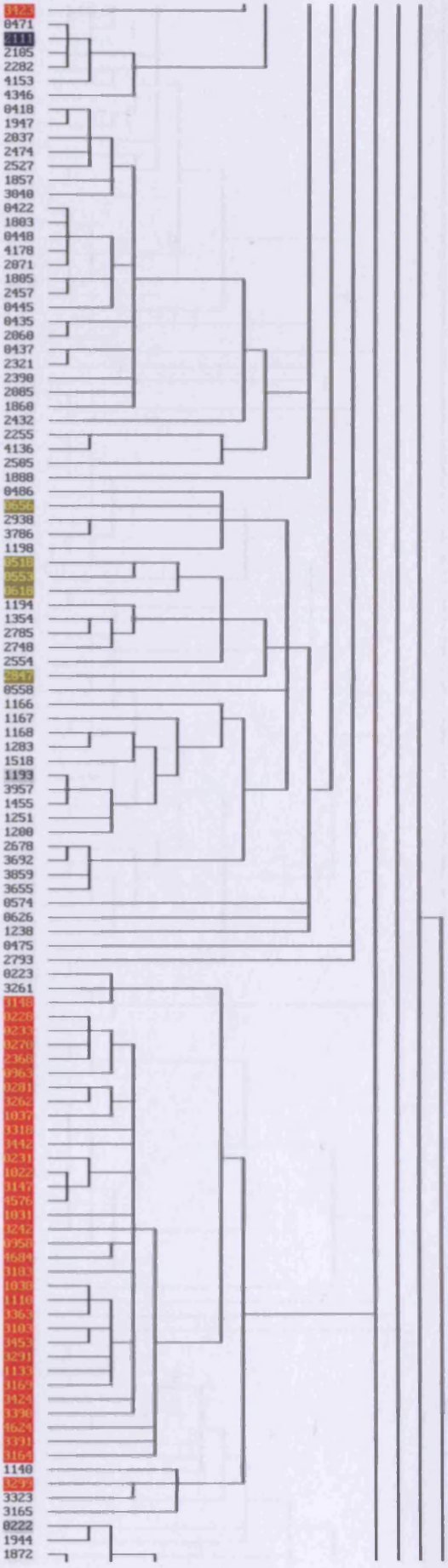


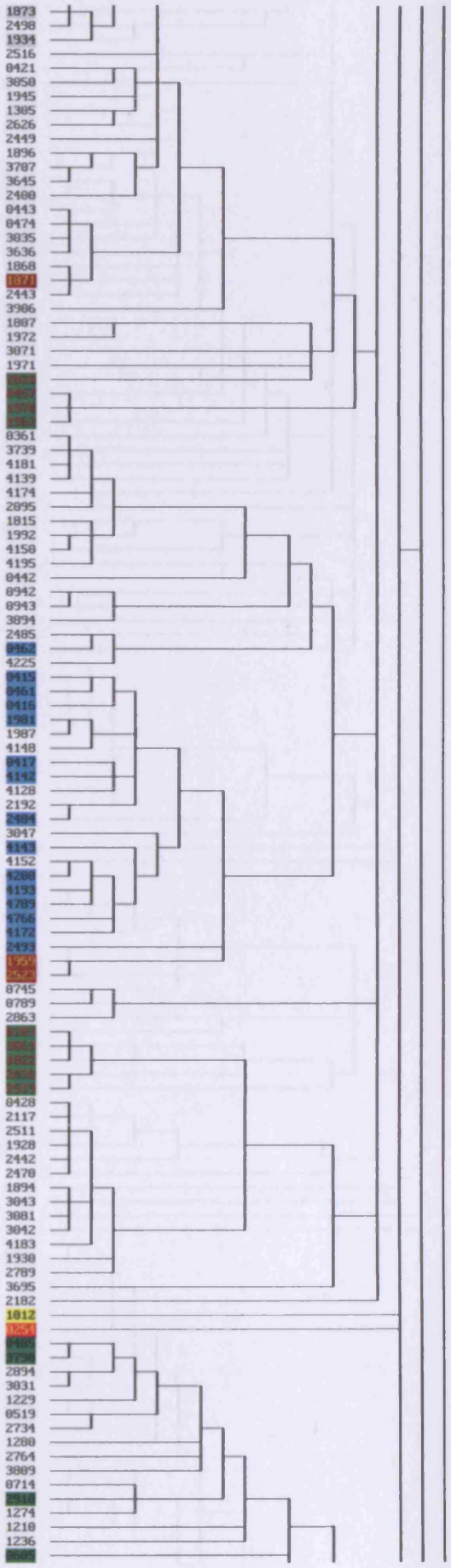

0042
0769
1136
2556
3569
0201
3176
1651
1744
1858
3652
0967
1597
2251
3827
3546
3567
3618
3109
1139
0117
0319
3457
3531
2000
1861
0118
1157
3263
3686
3052
0161
3578
1712
1436
3107
0791
0974
1046
1415
1879
1126
0200
3512
3517
3612
3597
3553
3571
3608
3611
3518
1316
0002
0633
2242
2289
1214
1218
3483
0034
0853
1068
1367
0984
3322
2875
0900
0480
0982
0957
1008
1694
1182
1695
4432
1831
3268
1117
1796
2587
0014
0634
1040
1158
3399
1661
3649
1064
1086
3562
1607
1680
1681
0266
0309
0311
1844
2234
3523
3524
0976
3653
2594
3783
1656
2065
1841
3094
0998

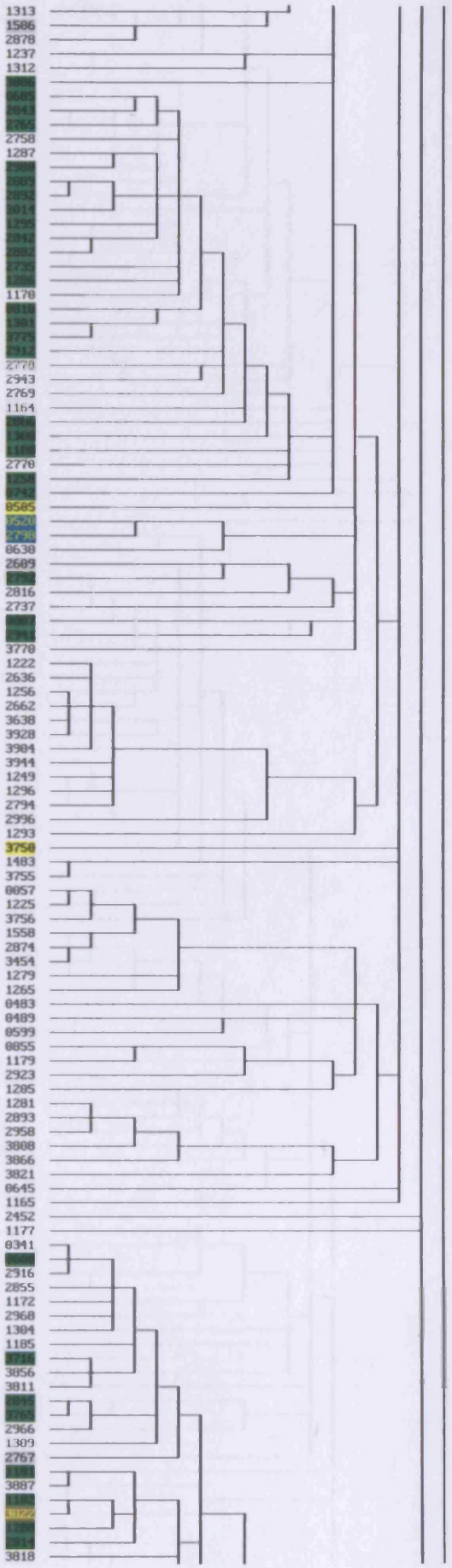

2593
0296
0959
4440
4327
0308
0705
3378
3502
2586
3379
3632
3585
3560
3563
3575
4426
4703
0738
1780
1845
3093
3140
0303
1071
1106
1083
1045
3271
2141
3709
4163
4686
1830
3320
0012
3289
0124
0176
1398
0250
1151
1020
1771
3806
0993
0989
3415
1760
1759
3416
1021
3990
1144
3321
3417
0282
0988
1118
3493
1629
3404
2213
0962
1019
1058
4730
0003
0968
2294
2569
1183
0119
1735
3237
0980
0987
1684
3344
3475
3436
3479
1667
3482
3550
3485
0981
2780
1060
3988
2786
3214
1003
1104
1617
1644
1687
1769
1677
3267
1277
1075
1066
1683
3059
1213
0235
1378
0109
3435

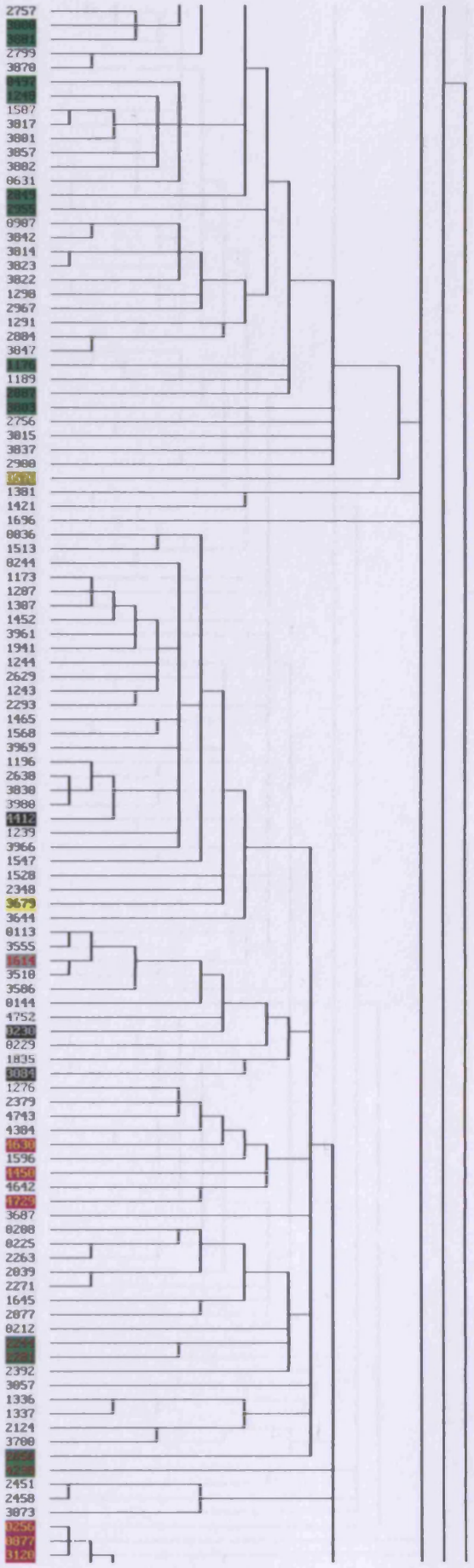

1009
3532
0995
0501
1689
1723
0996
1637
1142
1099
1082
1027
3557
1508
3226
3960
2214
1087
2431
3058
0076
0852
1154
1025
1090
3149
3714
0157
1052
3111
0780
0506
3221
0122
3926
1085
0182
3490
1056
0112
3526
1216
3545
1089
0994
1410
1437
0043
3431
1132
0005
3474
0133
0025
0032
3472
0093
3548
004B
1314
1340
0083
2555
0058
0060
1122
0062
3471
3535
0073
0105
0140
0049
0065
1348
1441
2607
0085
0092
0046
1338
2535
2546
0102
1448
1331
1208
1413
1320
3476
2537
3472
1400
0207
2543
2371
1608
0099
0143
2577
0147
0051
1343
0006
2747
2876
0053
0150
0035
1037

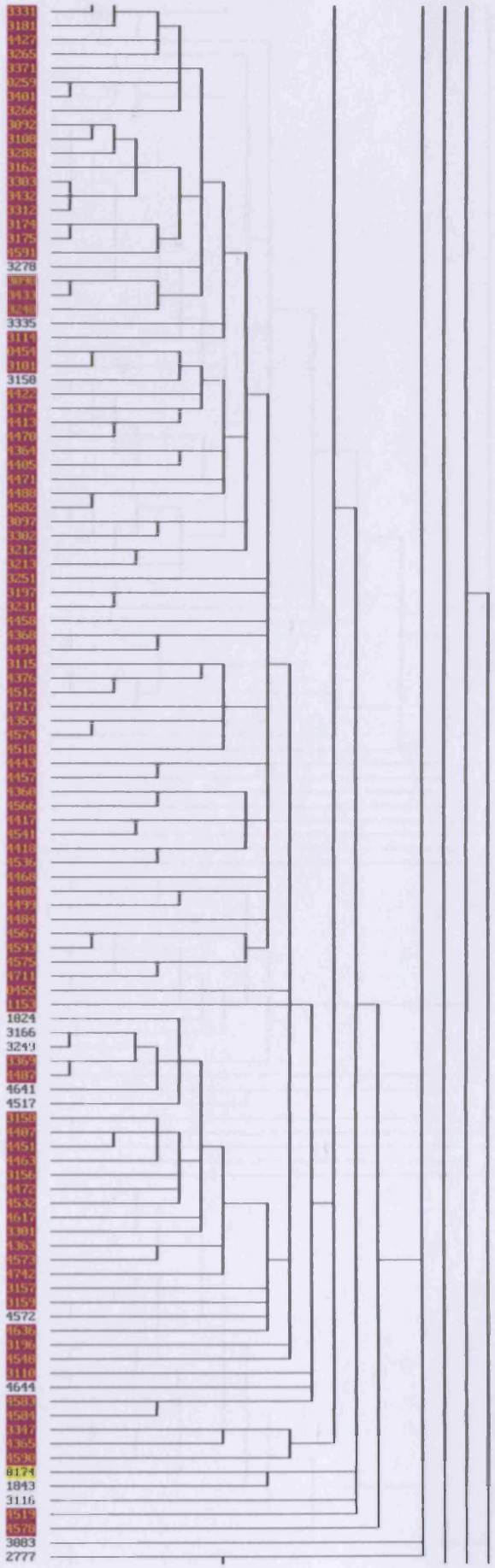

0258
0277
3565
2826
3497
3211
0104
1023
3596
3675
2359
0067
0094
0121
2604
2548
1616
3552
1438
0234
3091
3185
0335
2729
0663
0815
2621
2114
1479
1219
3976
0488
0819
1588
3833
2760
0748
0865
2801
0802
0851
0825
0876
0826
0864
2776
0875
2800
0854
0436
4170
0934
0949
0935
0951
2221
2454
4177
2433
4197
1980
2203
2256
2218
2074
4229
2217
2453
4121
1016

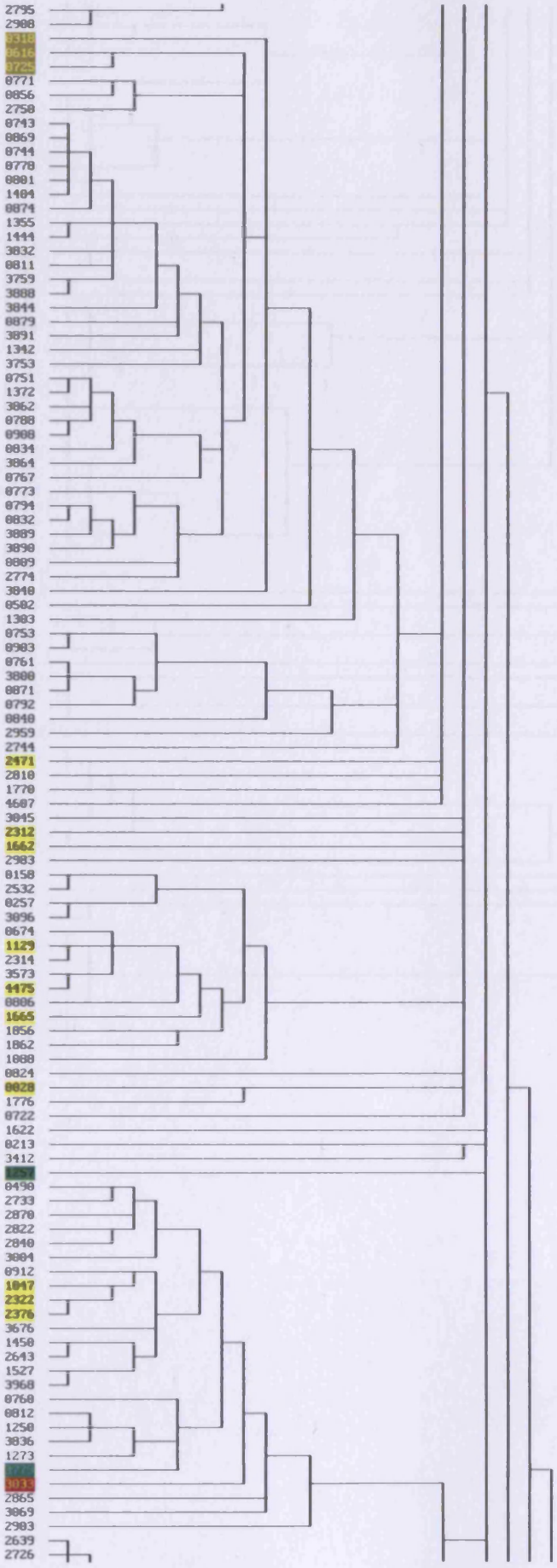

0471
2105
2282
4153
4346
0418
1947
2037
2474
2527
1857
3040
0422
1803
0448
4178
2071
1805
2457
0445
0435
2060
0437
2321
2390
2085
1860
2432
2255
4136
2505
1888
0486
2938
3786
1198
1194
1354
2785
2748
2554
0558
1166
1167
1168
1283
1518
3957
1455
1251
1200
2678
3692
3859
3655
0574
0626
1238
0475
2793
0223
3261
1140
3323
3165
0222
1944
1872


1873
2498
1934
2516
0421
3050
1945
1305
2626
2449
1896
3707
3645
2480
0443
0474
3035
3636
1868
1971
2443
3906
1807
1972
3071
1971
8361
3739
4181
4139
4174
2095
1815
1992
4150
4195
0442
0942
0943
3894
2485
0462
4225
0415
0461
0416
1981
1987
4148
0417
4142
4128
2192
2484
3047
4143
4152
4208
4193
4789
4766
4172
2433
1959
8745
0789
2863
0428
2117
2511
1928
2442
2470
1894
3043
3081
3042
4183
1930
2789
3695
2182
1012
2894
3031
1229
0519
2734
1280
2764
3009
0714
1274
1210
1236


1313
1586
2878
1237
1312
1170
2758
1287
2770
2943
2769
1164
2770
0585
2816
2737
3770
1222
2636
1256
2662
3638
3928
3904
3944
1249
1296
2794
2936
1293
3750
1483
3755
0057
1225
3756
1558
2874
3454
1279
1265
0483
0489
0599
0855
1179
2923
1205
1281
2893
2958
3808
3866
3821
0645
1165
2452
1177
0341
2916
2855
1172
2968
1304
1185
3856
3811
2966
1309
2767
3887
3818


2757
2799
3870
1587
3817
3801
3857
3802
0631
0987
3842
3814
3823
3822
1298
2967
1291
2884
3847
1189
2756
3815
3837
2980
1381
1421
1696
0836
1513
0244
1173
1287
1307
1452
3961
1941
1244
2629
1243
2293
1465
1568
3969
1196
2638
3830
3980
1239
3966
1547
1528
2348
3644
0113
3555
3510
3586
0144
4752
0229
1835
1276
2379
4743
4384
1596
4642
3687
0208
0225
2263
2039
2271
1645
2877
0212
2392
3057
1336
1337
2124
3700
2451
2458
3873




2795
2908
0318
0616
0725
0771
0856
2758
0743
0869
0744
0778
0801
1404
0874
1355
1444
3832
0811
3759
3888
3844
0879
3891
1342
3753
0751
1372
3862
0788
0908
0834
3864
0767
0773
0794
0832
3889
3890
0809
2774
3840
0502
1303
0753
0903
0761
3800
0871
0792
0840
2959
2744
2471
2810
1770
4607
3045
2312
1662
2983
0158
2532
0257
3096
0674
1129
2314
3573
4475
0806
1665
1856
1862
1088
0824
0028
1776
0722
1622
0213
3412
0490
2733
2870
2822
2840
3004
0912
1047
2322
2376
3676
1450
2643
1527
3968
0760
0812
1250
3836
1273
3013
2865
3069
2903
2639
2726

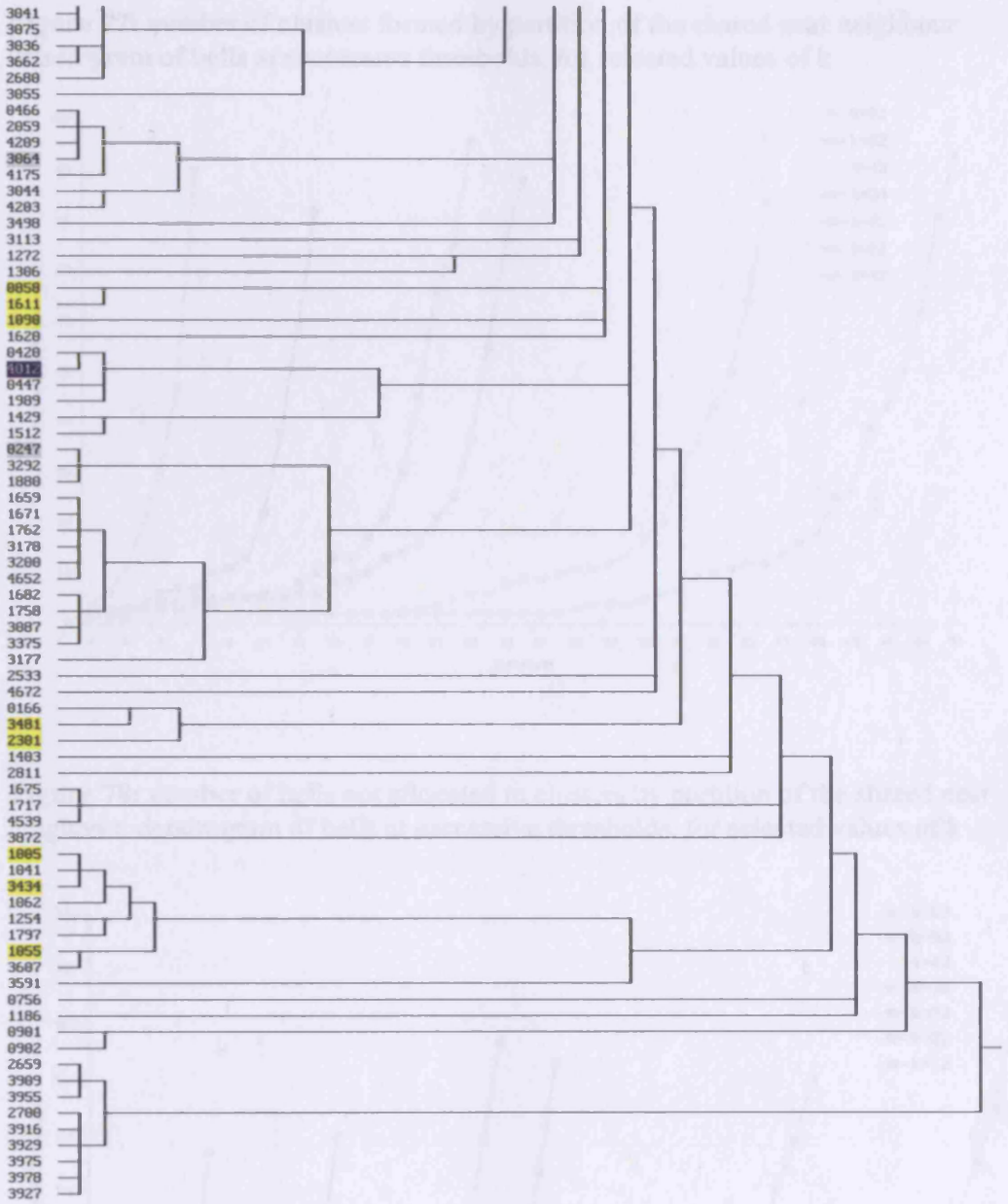

3041
3075
3036
3662
2680
3055
0466
2059
4209
3064
4175
3044
4203
3498
3113
1272
1306
0858
1611
1090
1620
0420
0311
0447
1989
1429
1512
0247
3292
1880
1659
1671
1762
3178
3200
4652
1682
1758
3087
3375
3177
2533
4672
0166
3481
2301
1403
2811
1675
1717
4539
3872
1005
1041
3434
1062
1254
1797
1055
3607
3591
0756
1186
0301
0902
2659
3909
3955
2700
3916
3929
3975
3978
3927

Figure 77: number of clusters formed by partition of the shared near neighbour dendrogram of bells at successive thresholds, for selected values of k

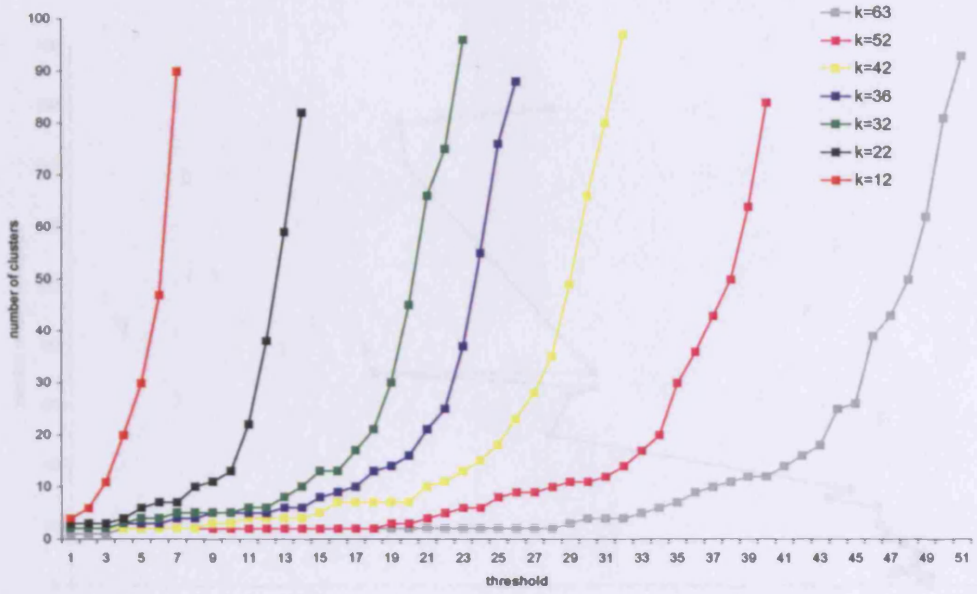


Figure 78: number of bells not allocated to clusters by partition of the shared near neighbour dendrogram of bells at successive thresholds, for selected values of k

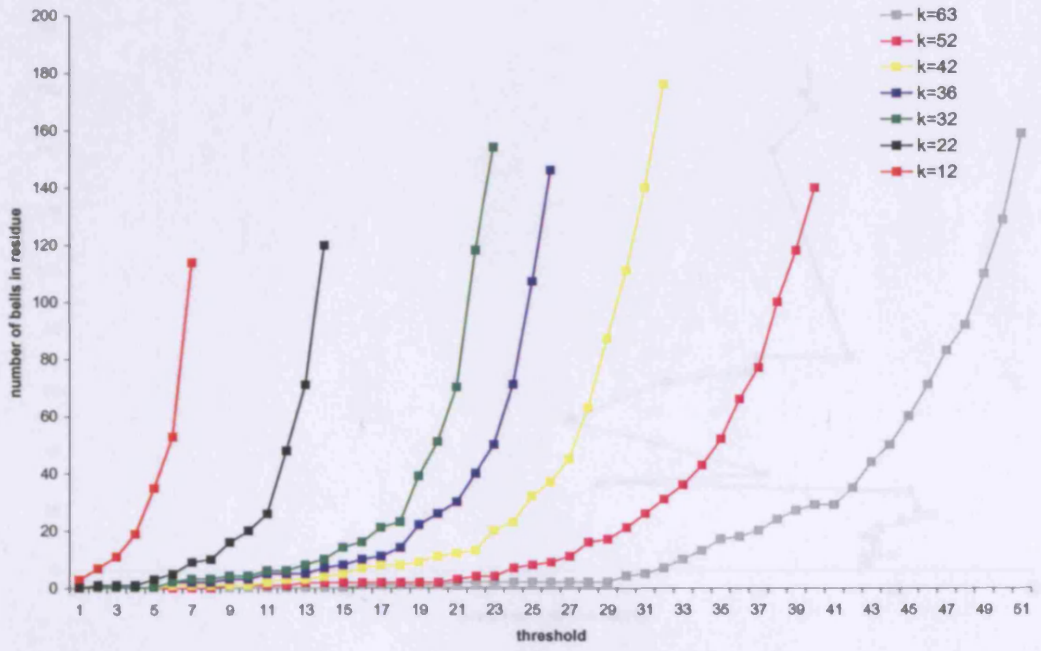


Figure 79: percentage overall error relating to documented founders and number of bells not allocated to clusters for the partitions shown in Table 19

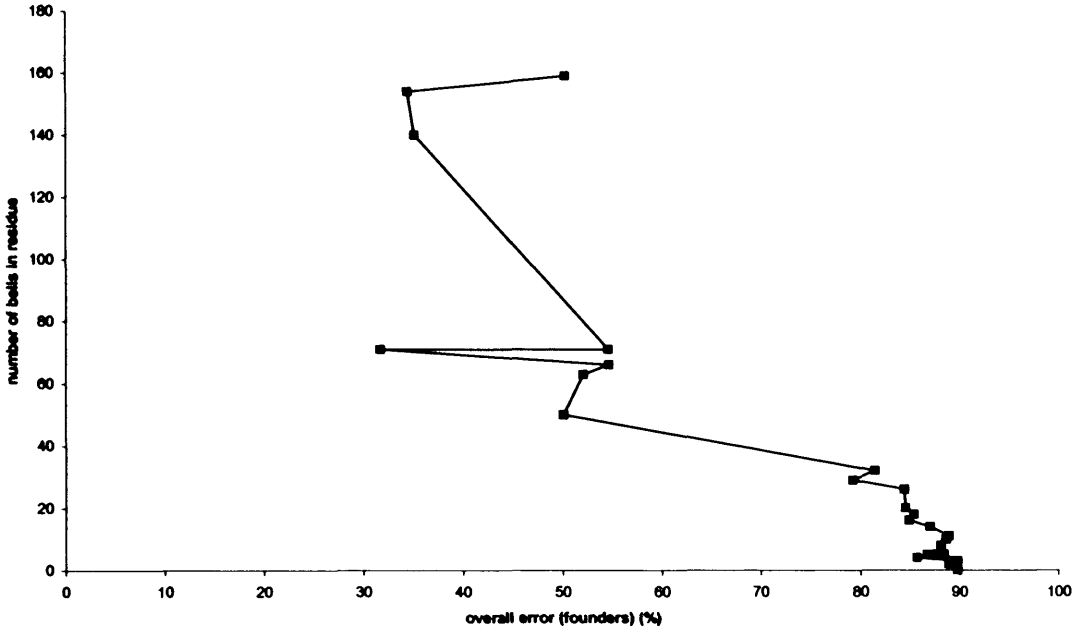


Figure 80: percentage overall error relating to documented foundries and number of bells not allocated to clusters for the partitions shown in Table 24

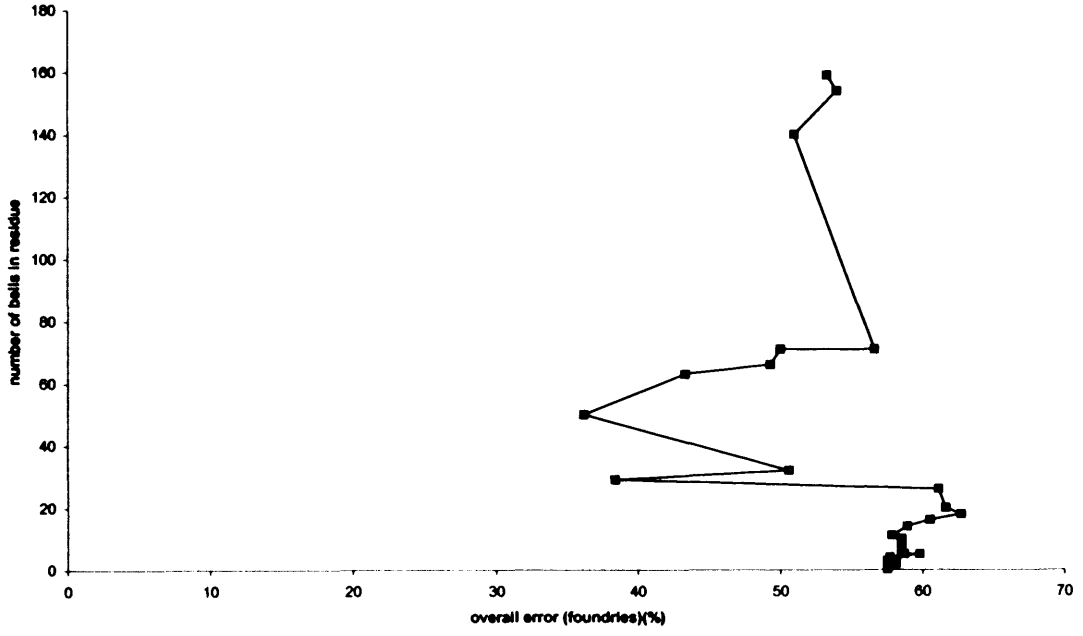
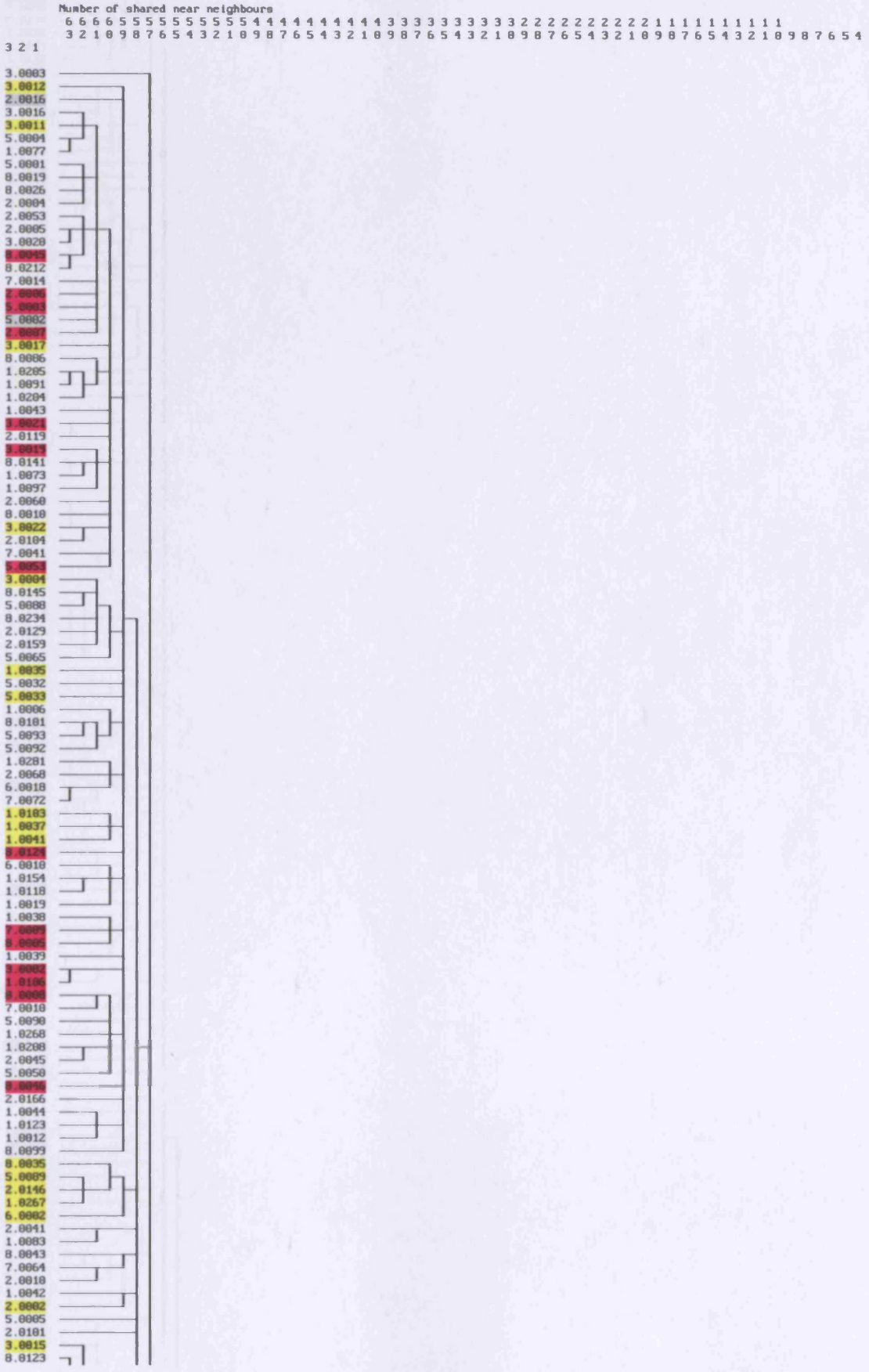
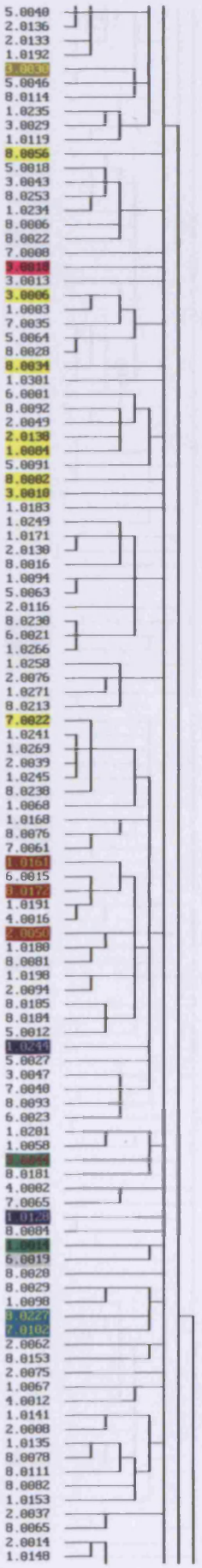
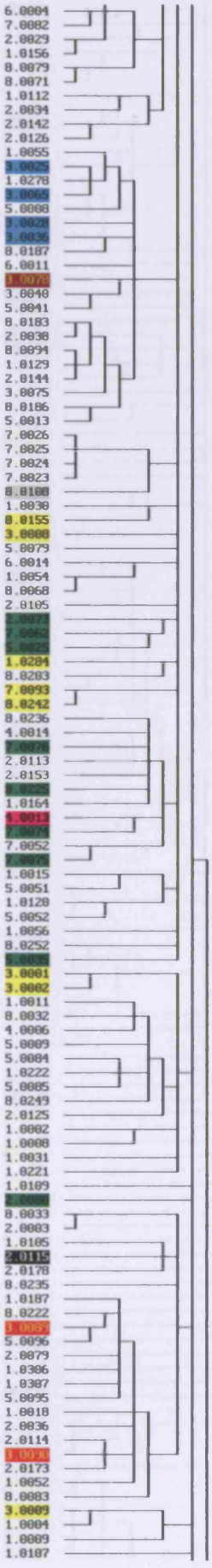
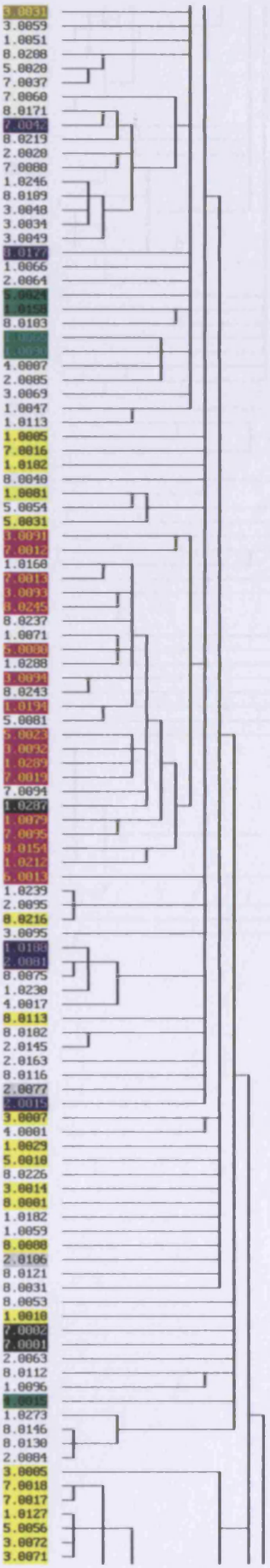


Figure 81: Shared Near Neighbour Clustering of types, using the Jaccard similarity coefficient and considering 63 near neighbours




5.0040
2.0136
2.0133
1.0192
3.0030
5.0046
8.0114
1.0235
3.0029
1.0119
8.0056
5.0018
3.0043
8.0253
1.0234
8.0006
8.0022
7.0008
7.0010
3.0013
3.0006
1.0083
7.0035
5.0064
8.0028
8.0034
1.0301
6.0001
8.0092
2.0049
2.0138
1.0084
5.0091
8.0002
3.0010
1.0183
1.0249
1.0171
2.0130
8.0016
1.0094
5.0063
2.0116
8.0230
6.0021
1.0266
1.0258
2.0076
1.0271
8.0213
7.0022
1.0241
1.0269
2.0039
1.0245
8.0238
1.0068
1.0168
8.0076
7.0061
1.0161
6.0015
3.0122
1.0191
4.0016
5.0050
1.0180
8.0081
1.0198
2.0094
8.0185
8.0184
5.0012
1.0244
5.0027
3.0047
7.0040
8.0093
6.0023
1.0201
1.0058
1.0044
8.0181
4.0002
7.0065
1.0138
8.0084
1.0014
6.0019
8.0020
8.0029
1.0098
3.0227
7.0102
2.0062
8.0153
2.0075
1.0067
4.0012
1.0141
2.0008
1.0135
8.0078
8.0111
8.0082
1.0153
2.0037
8.0065
2.0014
1.0148


6.0004
7.0082
2.0029
1.0156
8.0079
8.0071
1.0112
2.0034
2.0142
2.0126
1.0055
3.0025
1.0278
3.0065
5.0008
3.0028
3.0036
8.0187
6.0011
1.0078
3.0040
5.0041
8.0183
2.0038
8.0094
1.0129
2.0144
3.0075
8.0186
5.0013
7.0026
7.0025
7.0024
7.0023
8.0108
1.0030
8.0155
3.0008
5.0079
6.0014
1.0054
8.0068
2.0105
2.0073
7.0062
5.0025
1.0204
8.0203
7.0093
8.0242
8.0236
4.0014
7.0076
2.0113
2.0153
1.0164
5.0013
7.0074
7.0052
7.0075
1.0015
5.0051
1.0128
5.0052
1.0056
8.0252
5.0038
3.0001
3.0002
1.0011
8.0032
4.0006
5.0009
5.0084
1.0222
5.0085
8.0249
2.0125
1.0002
1.0008
1.0031
1.0221
1.0109
2.0008
8.0033
2.0003
1.0105
2.0115
2.0178
8.0235
1.0187
8.0222
1.0093
5.0096
2.0079
1.0306
1.0307
5.0095
1.0018
2.0036
2.0114
1.0073
2.0173
1.0052
8.0083
3.0009
1.0004
1.0009
1.0107



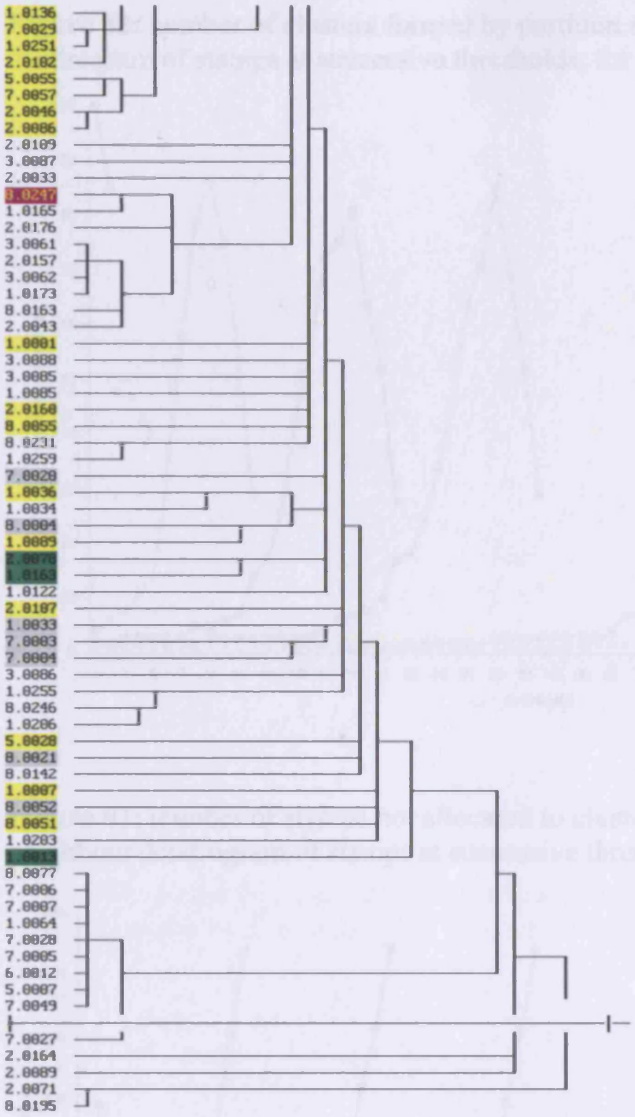

1.0136
7.0029
1.0251
2.0102
5.0055
7.0057
2.0046
2.0086
2.0109
3.0087
2.0033
1.0247
1.0165
2.0176
3.0061
2.0157
3.0062
1.0173
8.0163
2.0043
1.0001
3.0088
3.0085
1.0085
2.0168
8.0055
8.0231
1.0259
7.0020
1.0036
1.0034
8.0004
1.0089
2.0078
1.0163
1.0122
2.0107
1.0033
7.0003
7.0004
3.0086
1.0255
8.0246
1.0206
5.0028
8.0021
8.0142
1.0007
8.0052
8.0051
1.0203
1.0013
8.0077
7.0006
7.0007
1.0064
7.0028
7.0005
6.0012
5.0007
7.0049
7.0027
2.0164
2.0089
2.0071
8.0195

Figure 82: number of clusters formed by partition of the shared near neighbour dendrogram of stamps at successive thresholds, for selected values of k

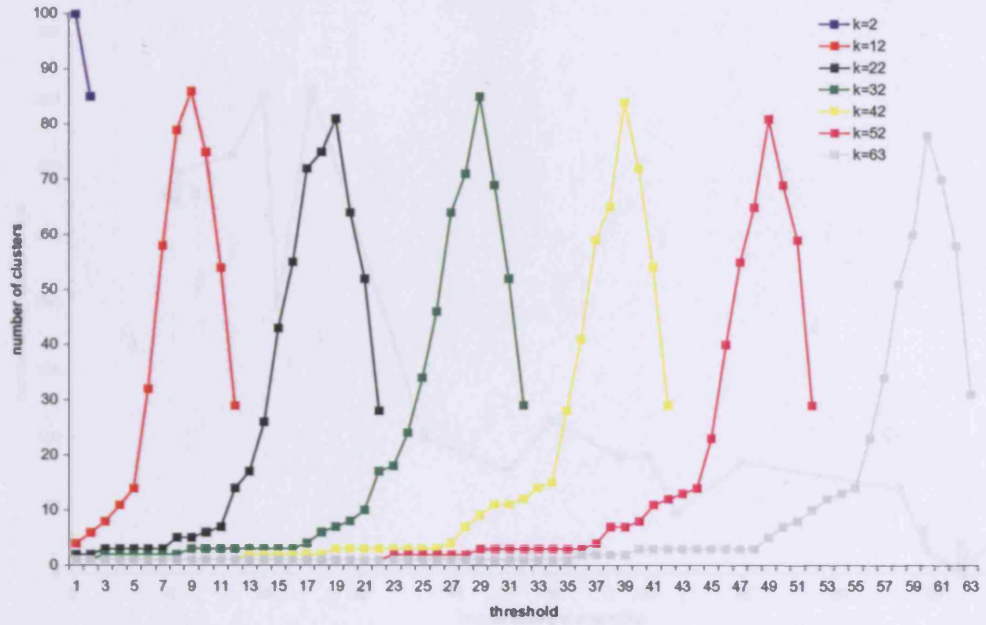


Figure 83: number of stamps not allocated to clusters by partition of the shared near neighbour dendrogram of stamps at successive thresholds, for selected values of k

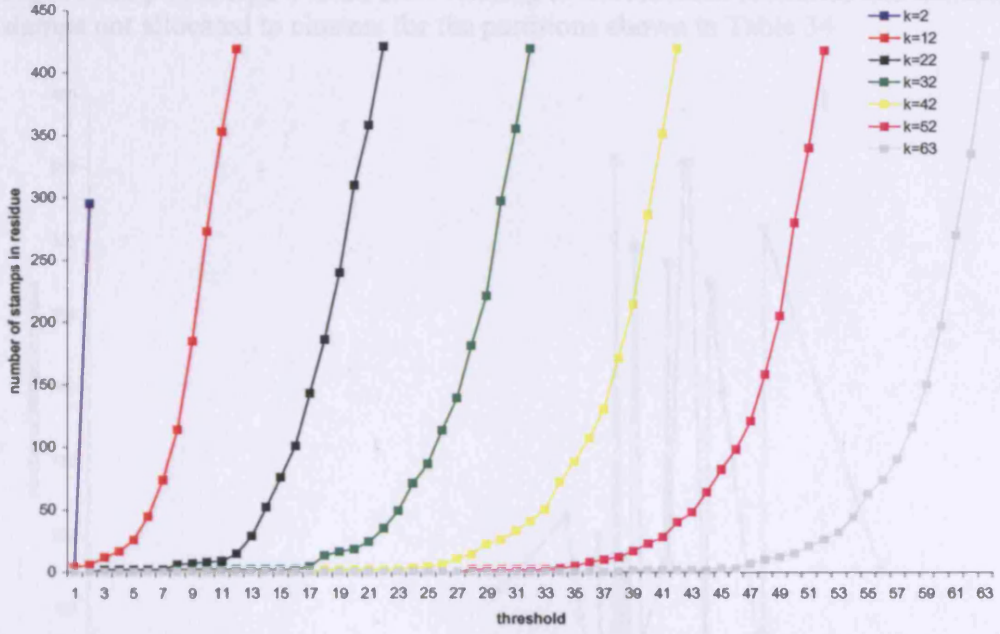


Figure 84: percentage overall error relating to documented founders and number of stamps not allocated to clusters for the partitions shown in Table 27

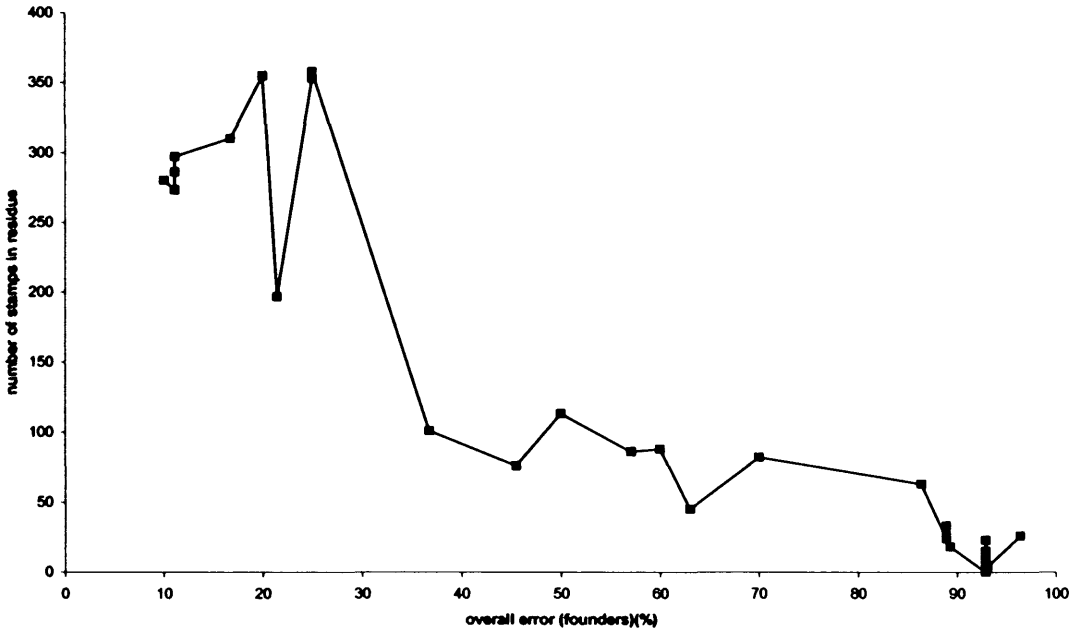


Figure 85: percentage overall error relating to documented foundries and number of stamps not allocated to clusters for the partitions shown in Table 34

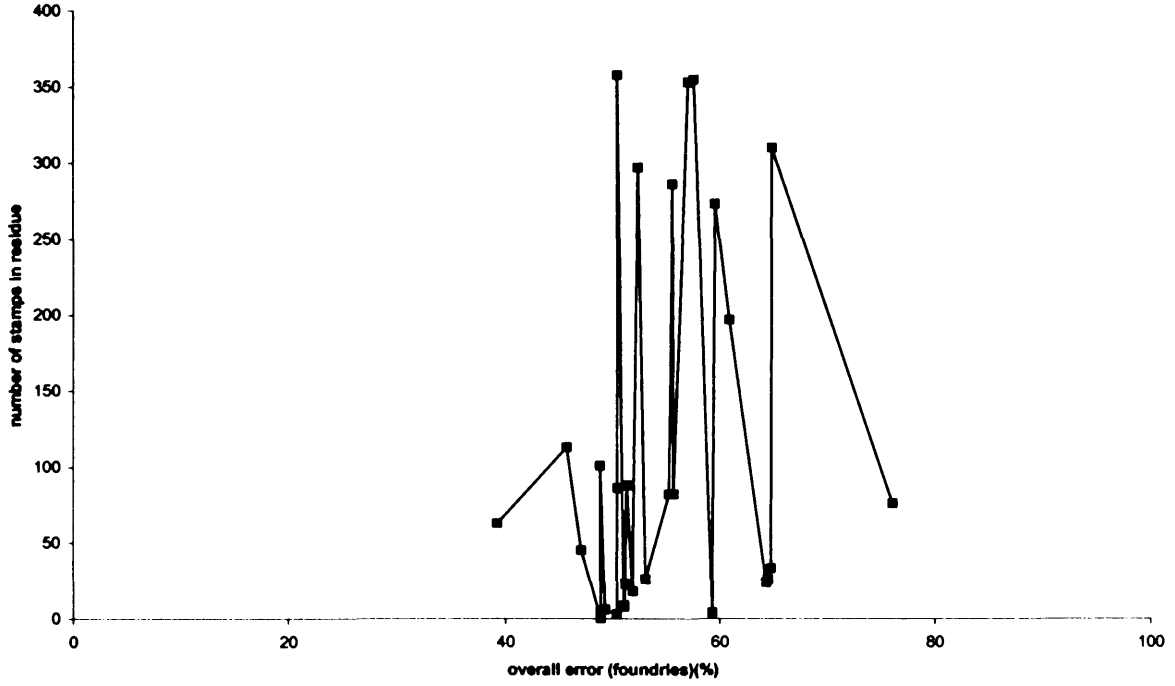


Figure 86: two-dimensional map of bells produced by correspondence analysis of the complete (reduced) incidence matrix comprising 1289 bells and 509 stamps

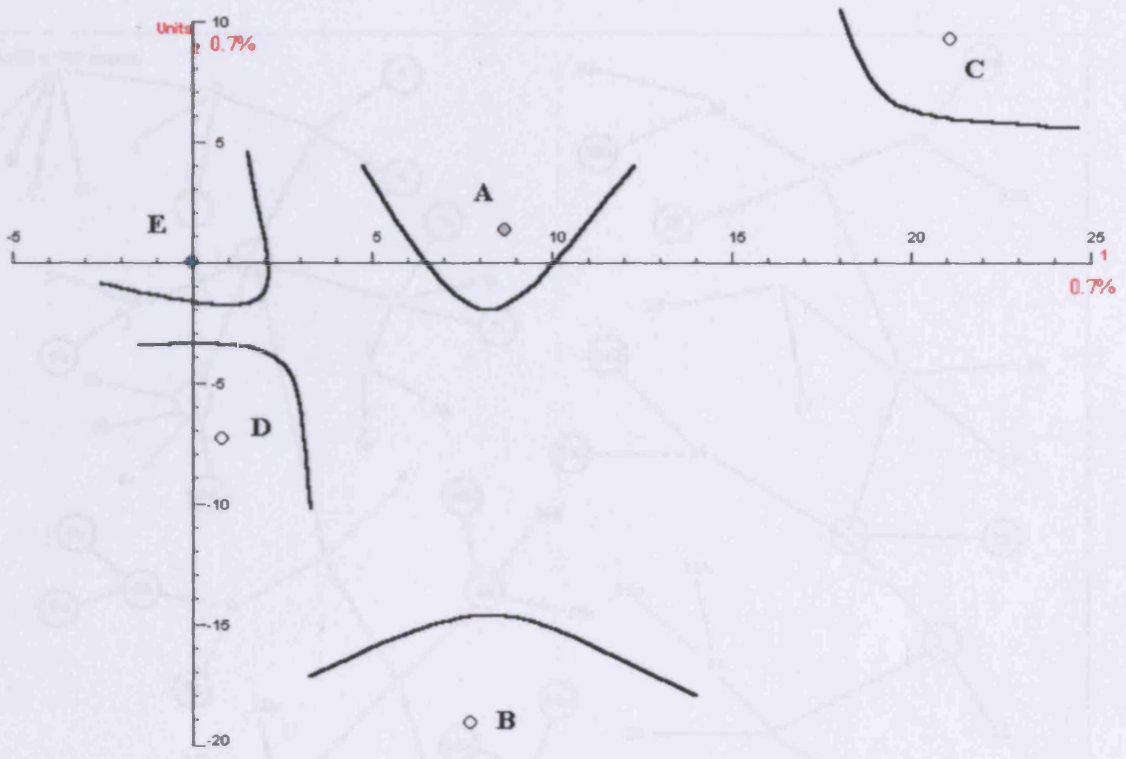


Figure 87: summary of clusters of bells formed by 'peeling' of the data during successive correspondence analyses: groups which are not further divided have single nodes, analyses showing the 'horseshoe' effect are circled

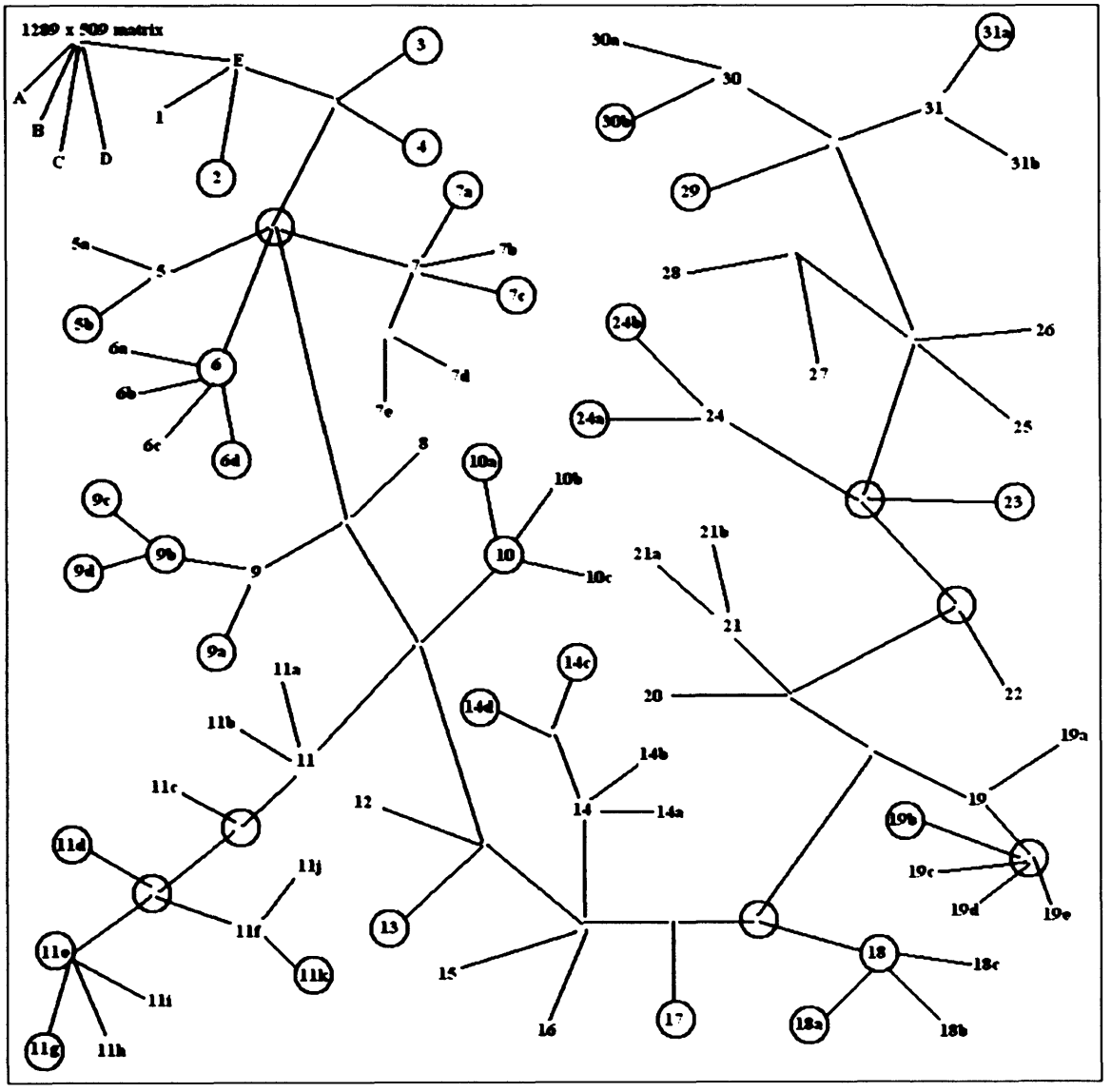


Figure 88: map of bells produced by correspondence analysis of cluster A

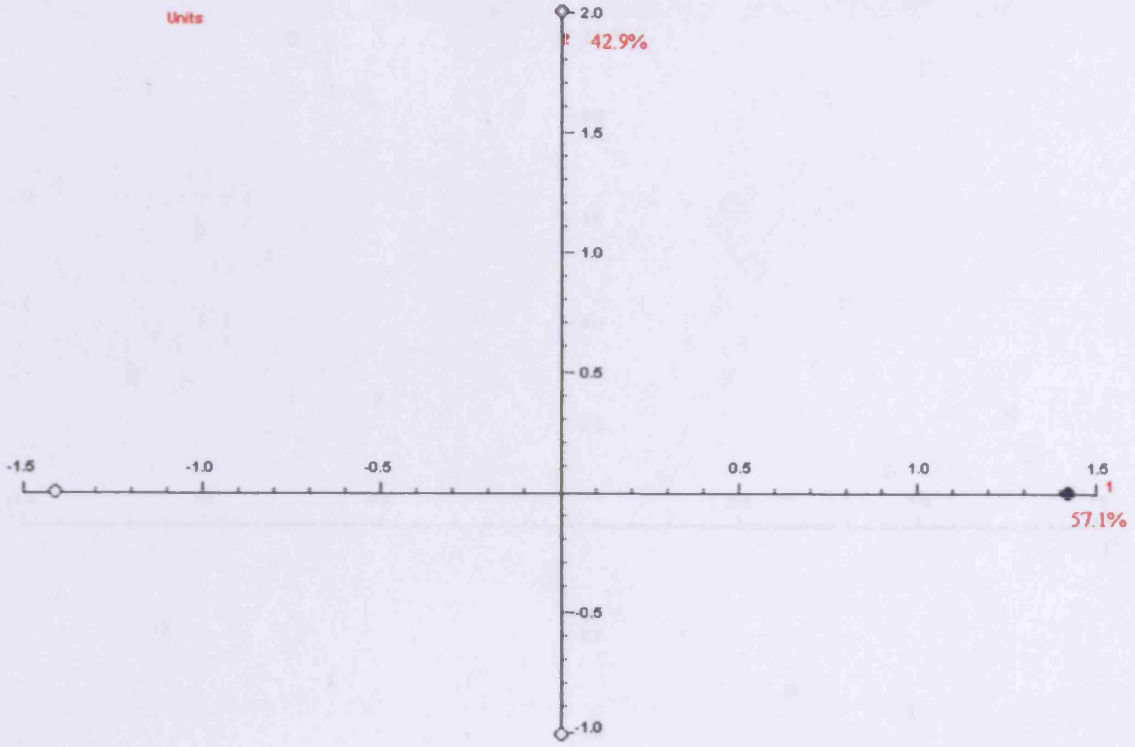


Figure 89: two-dimensional map of bells produced by correspondence analysis of cluster E, showing segregation of clusters 1 and 2

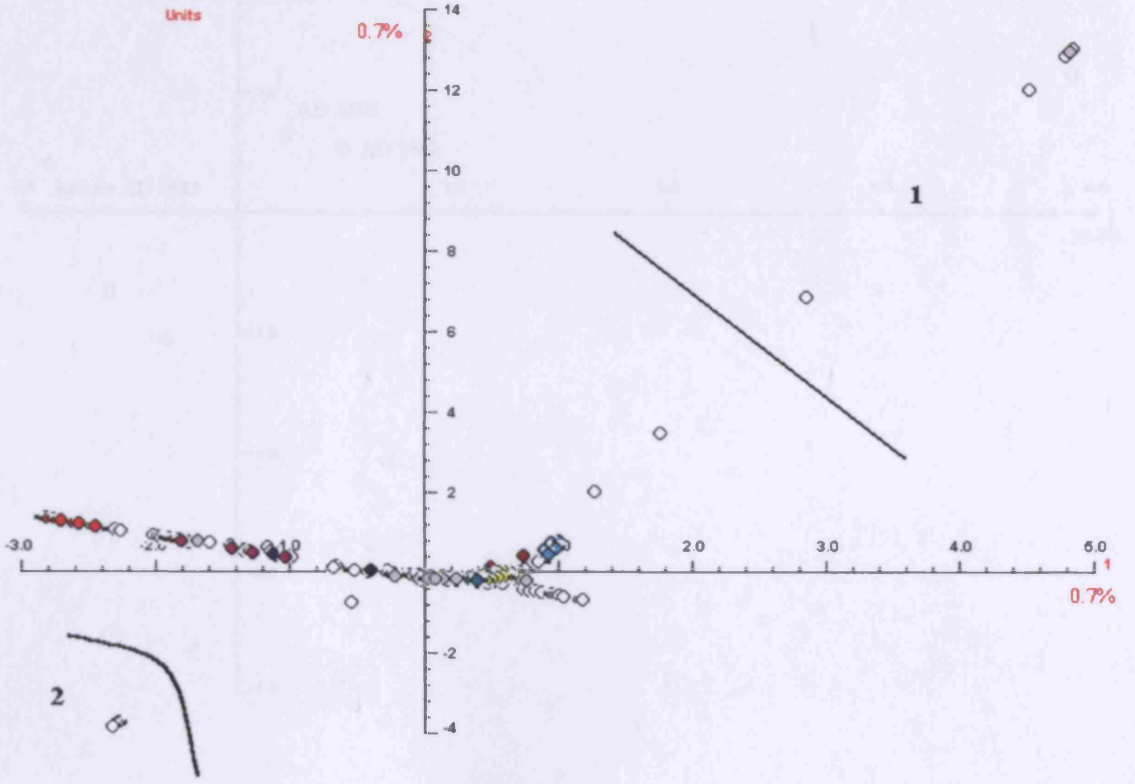


Figure 90: map of bells produced by correspondence analysis of cluster 1

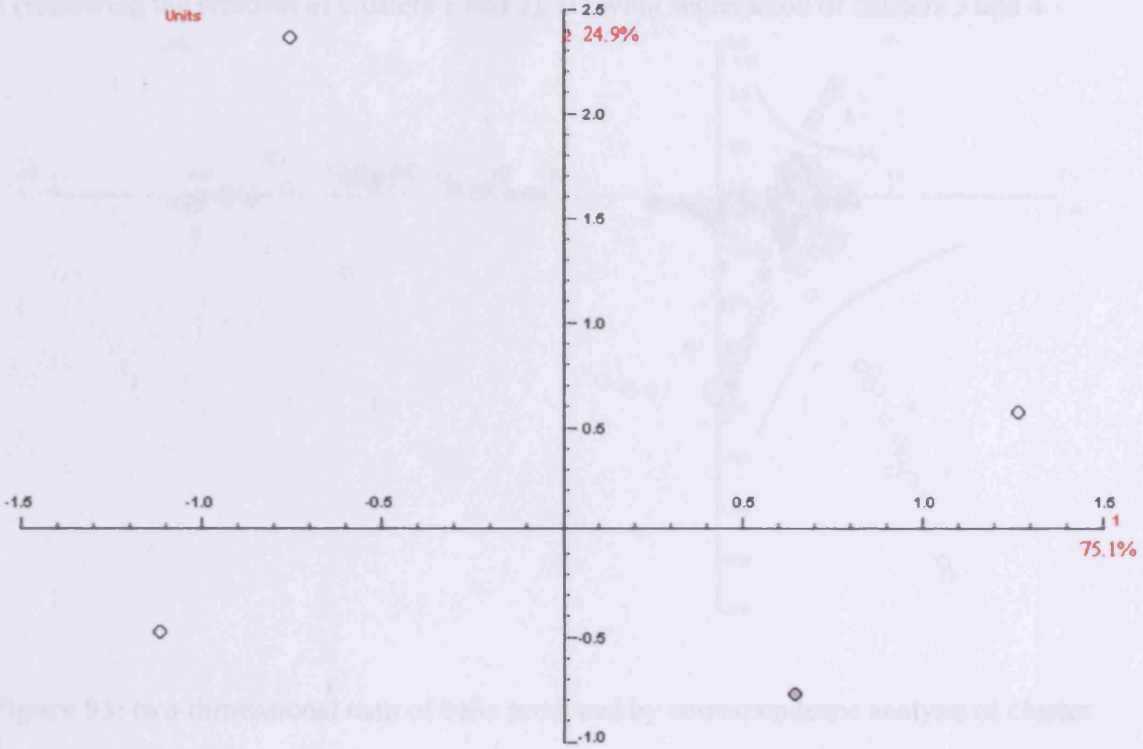


Figure 91: map of bells produced by correspondence analysis of cluster 2

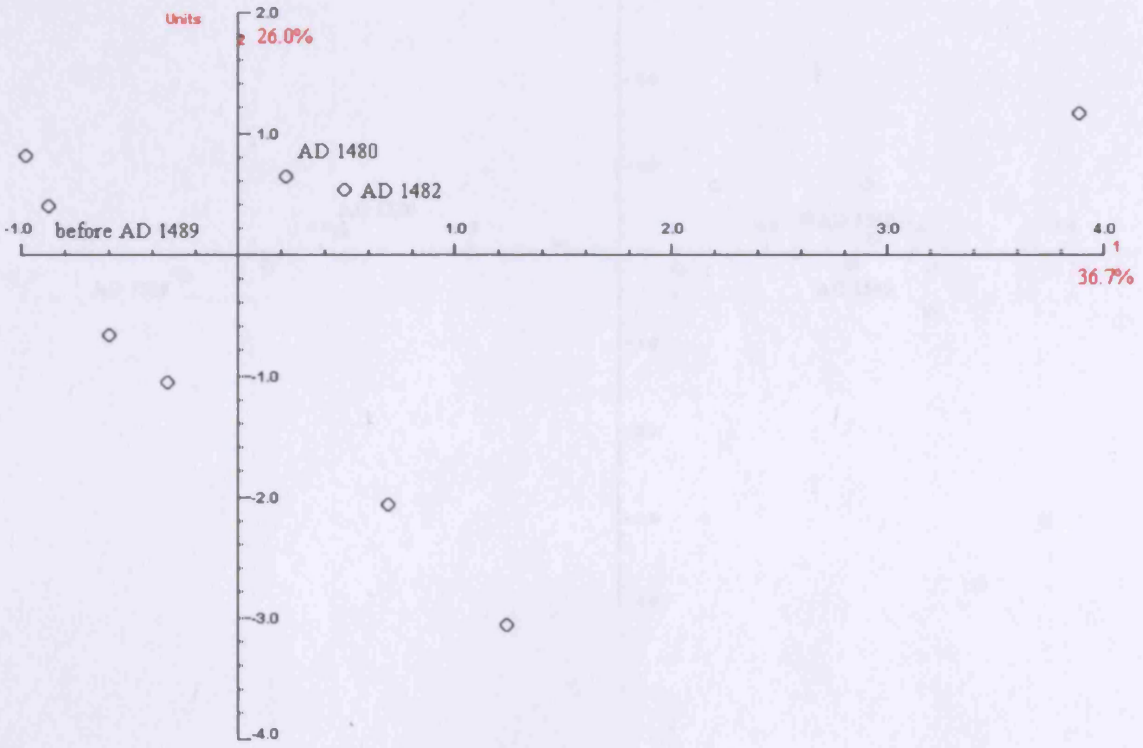


Figure 92: two-dimensional map of bells produced by correspondence analysis of cluster E (following the removal of clusters 1 and 2), showing segregation of clusters 3 and 4

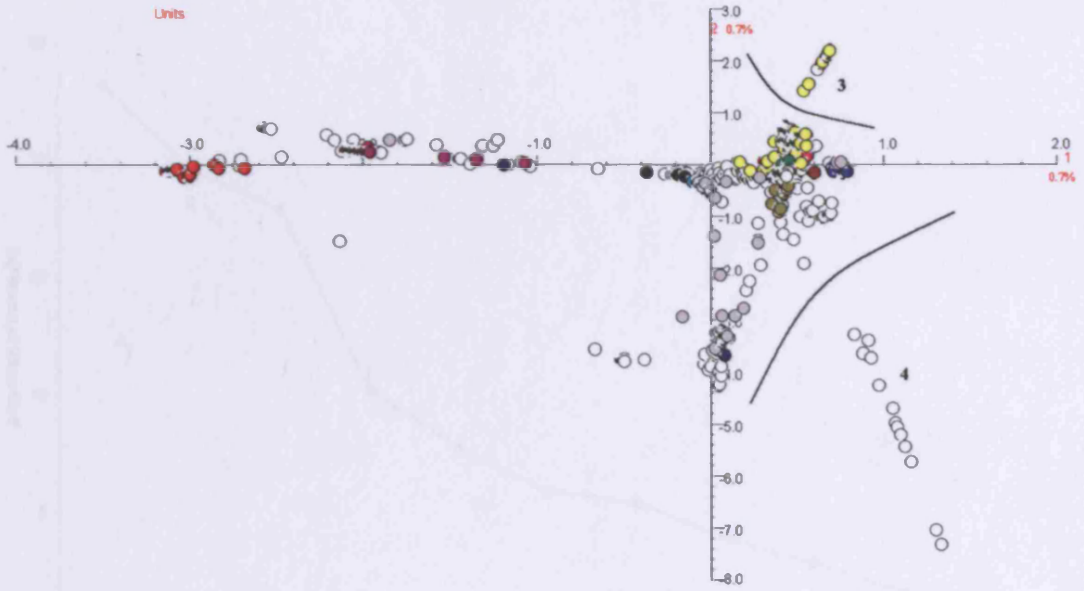


Figure 93: two-dimensional map of bells produced by correspondence analysis of cluster 3

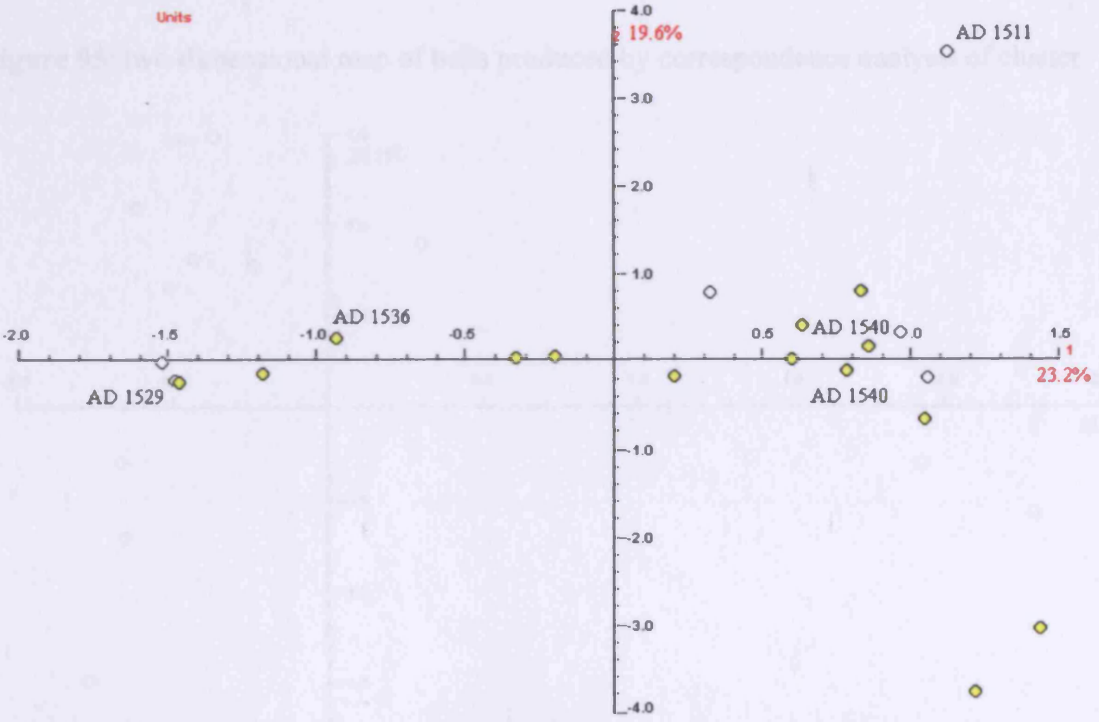


Figure 94: proportion of inertia explained by axes of the correspondence analysis of cluster 3

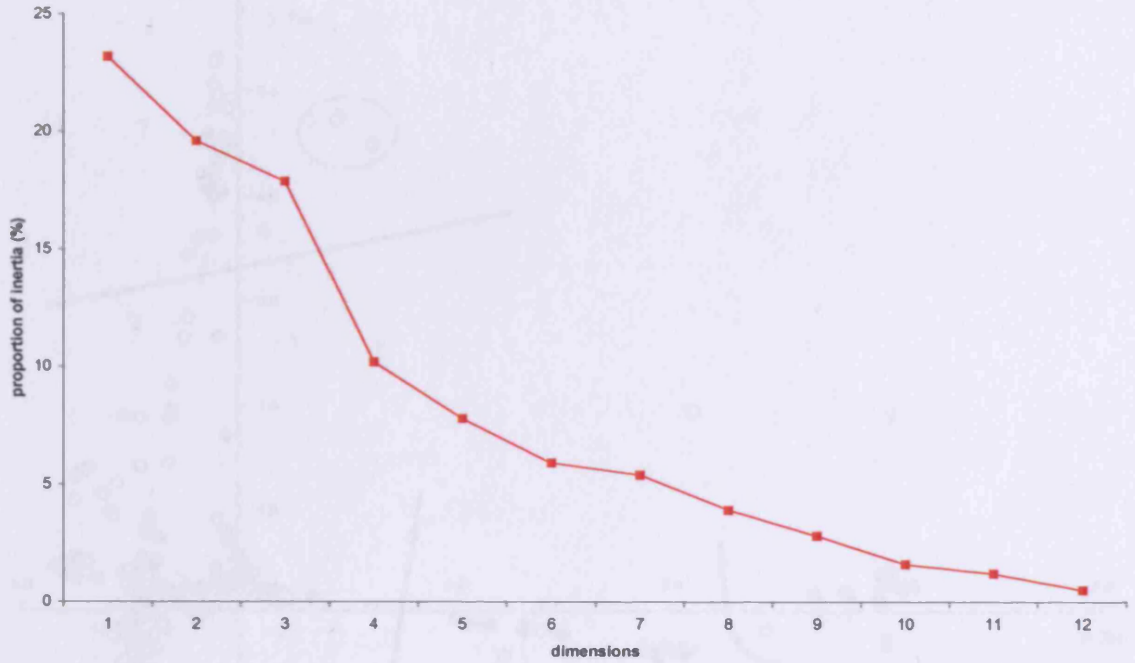


Figure 95: two-dimensional map of bells produced by correspondence analysis of cluster 4

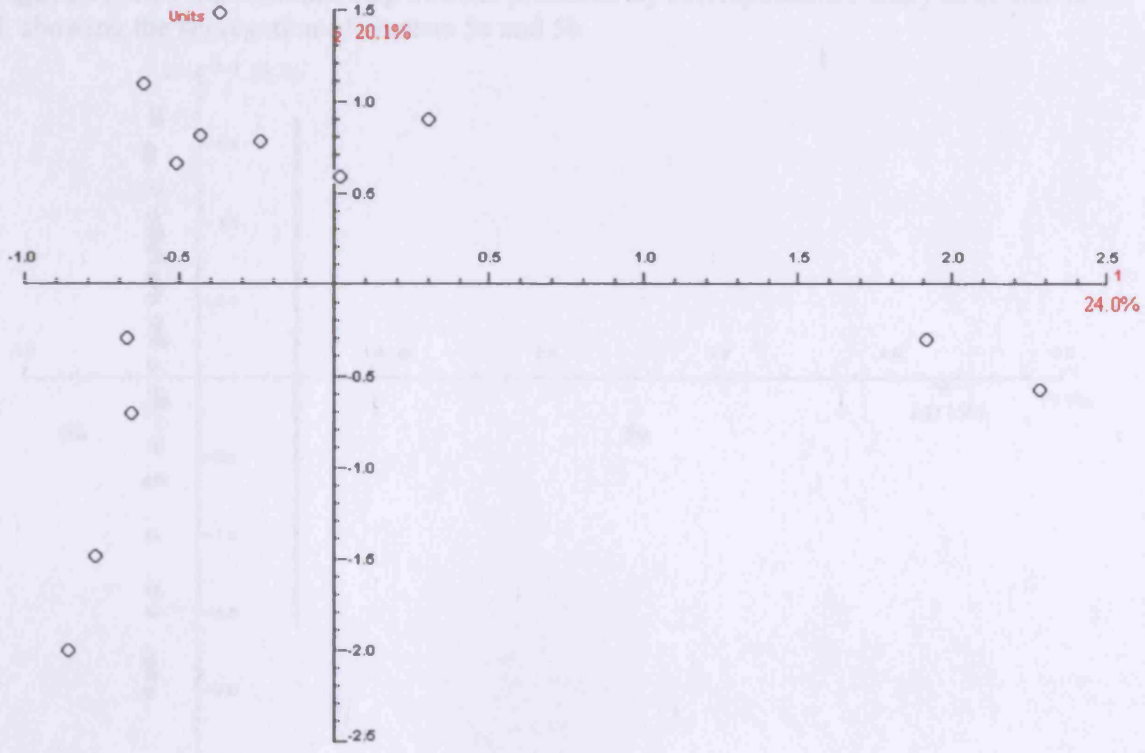


Figure 96: two-dimensional map of bells produced by correspondence analysis of cluster E (following the removal of clusters 1-4), showing segregation of clusters 5-7

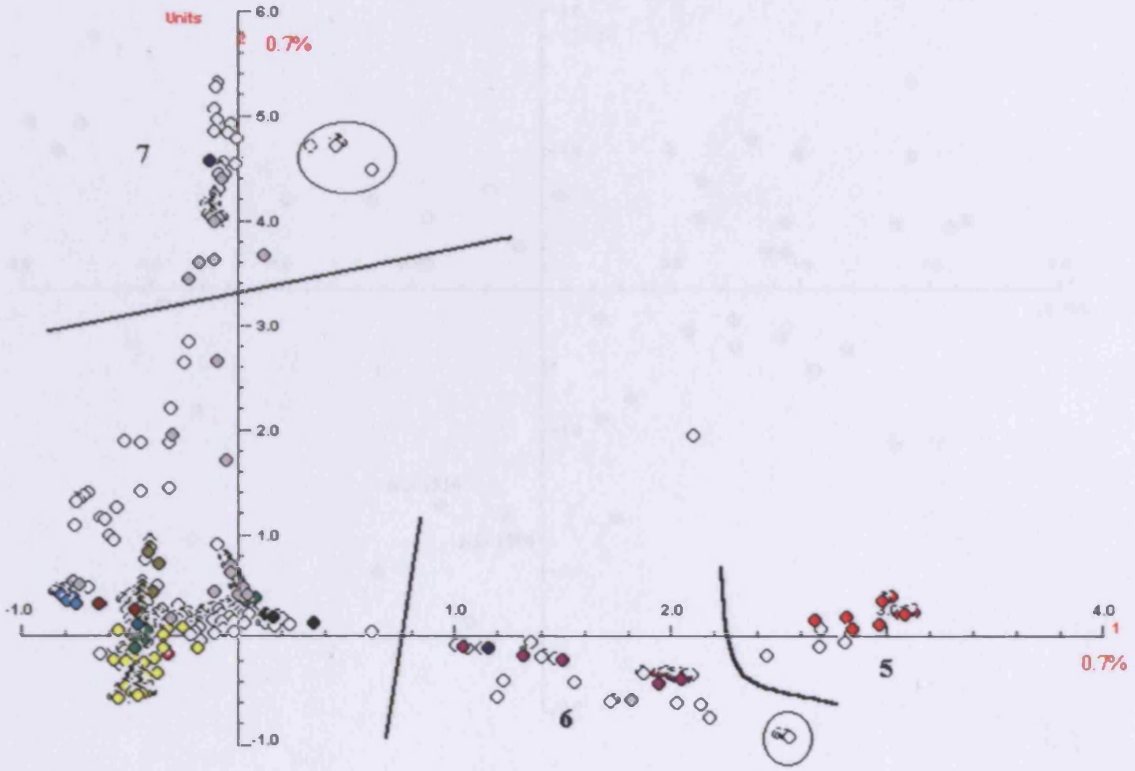


Figure 97: two-dimensional map of bells produced by correspondence analysis of cluster 5, showing the segregation of clusters 5a and 5b

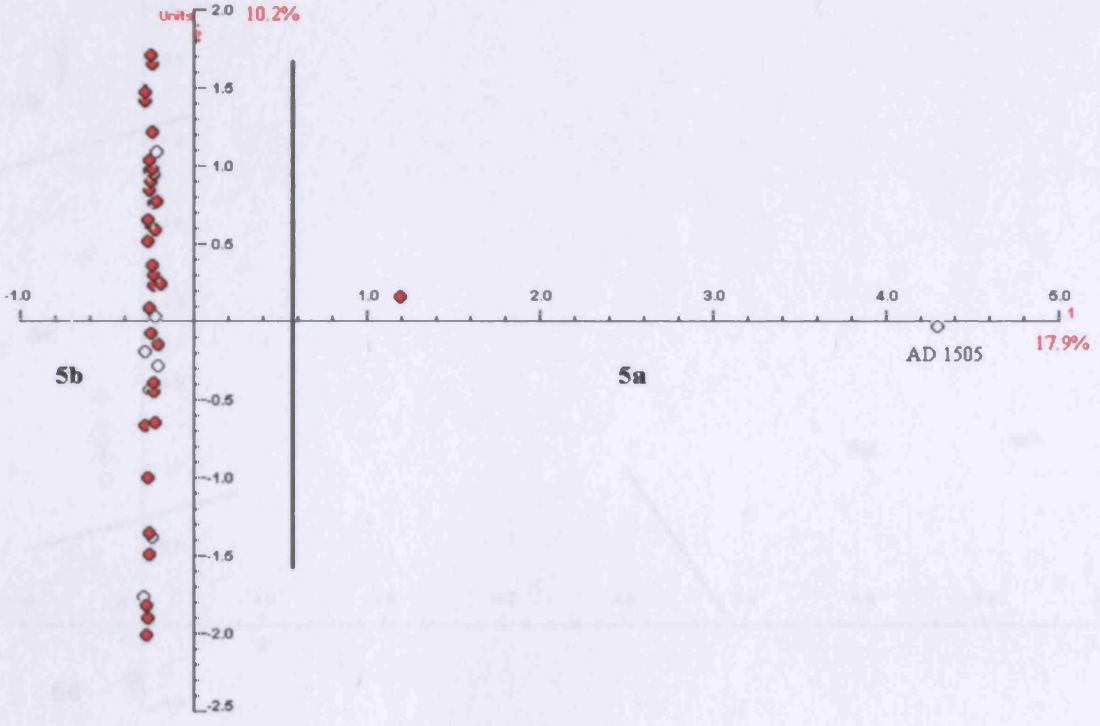


Figure 98: two-dimensional map of bells produced by correspondence analysis of cluster 5b

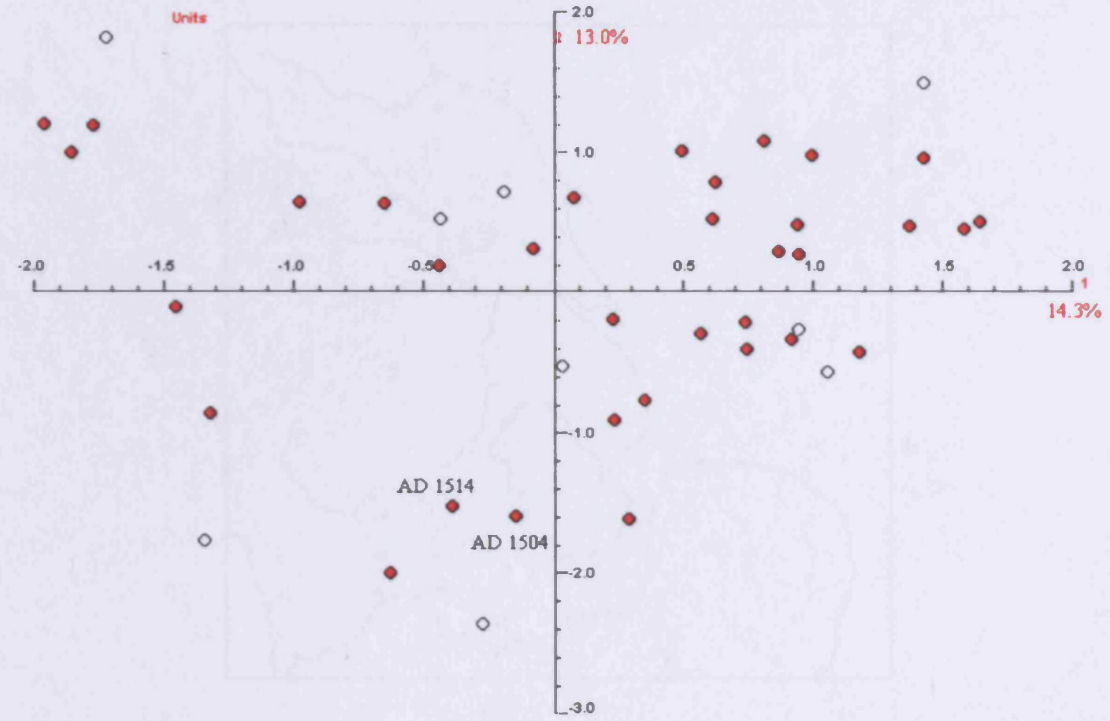


Figure 99: two-dimensional map of bells produced by correspondence analysis of cluster 6, showing the segregation of clusters 6a-6d

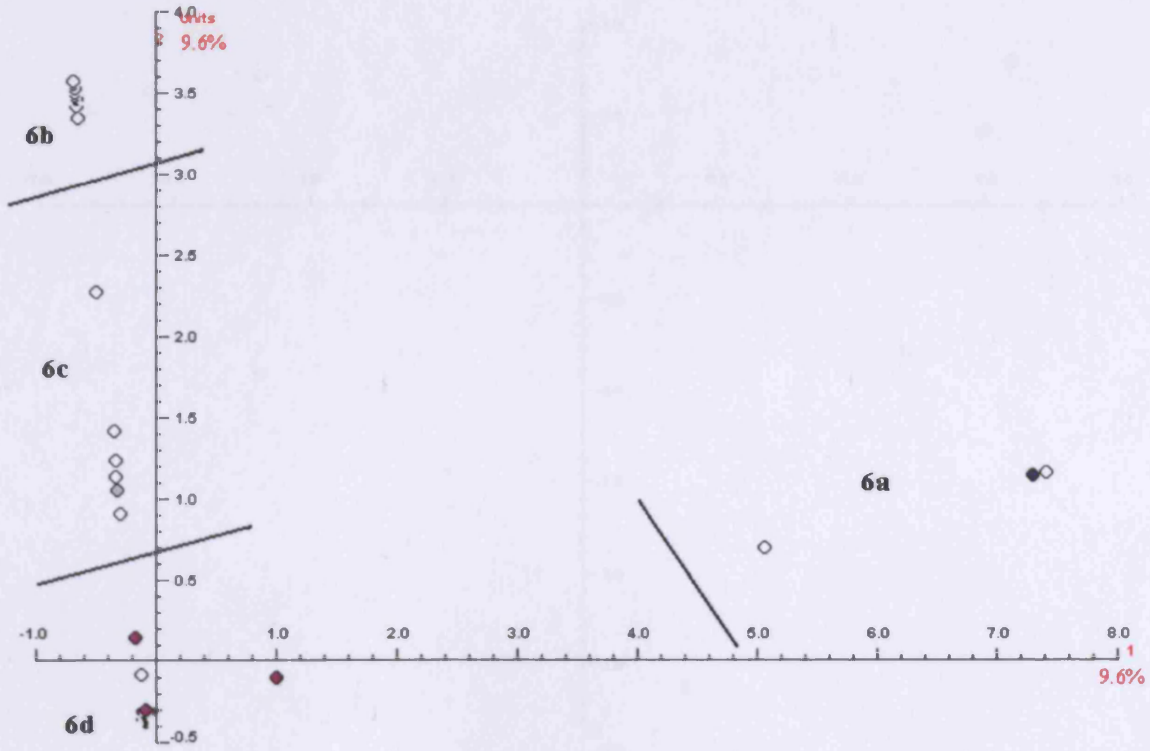


Figure 100: location map showing bells inscribed with the name "Thomas de Wald" and bells associated with cluster 6a

Figure 101: two-dimensional map of bells produced by correspondence analysis of cluster 6b

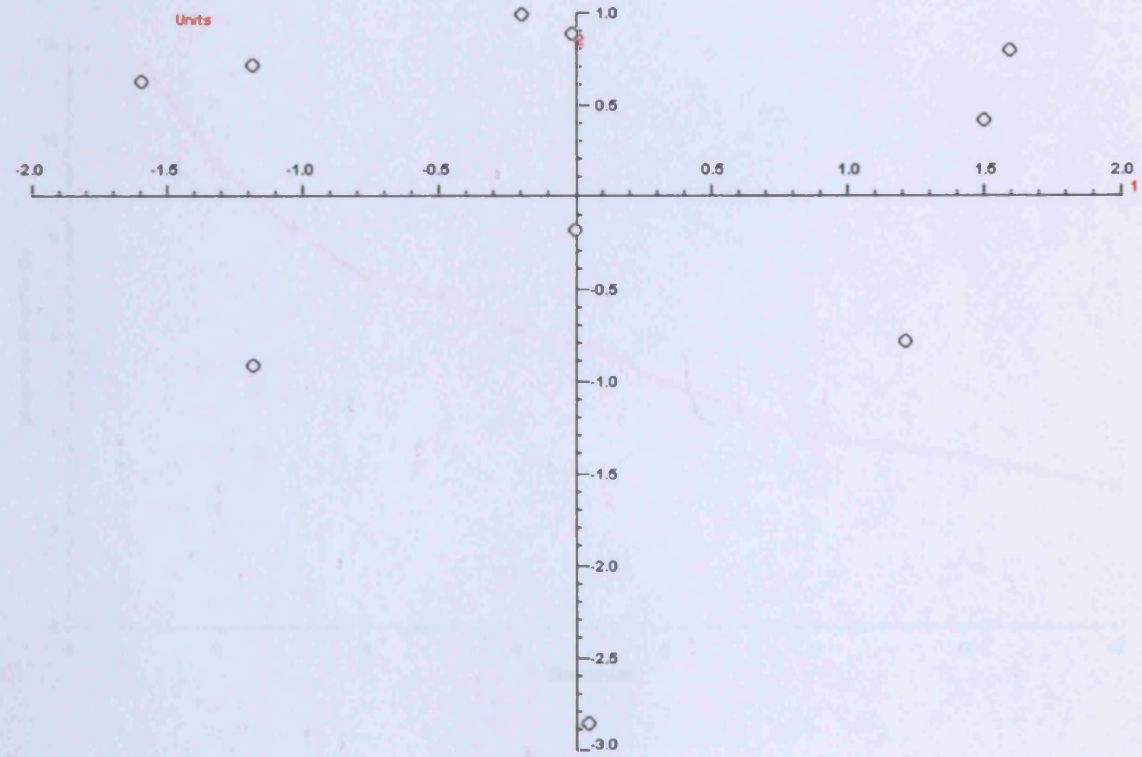


Figure 102: location map showing bells associated with cluster 6b

Figure 103: proportion of inertia explained by axes of the correspondence analysis of cluster 6d

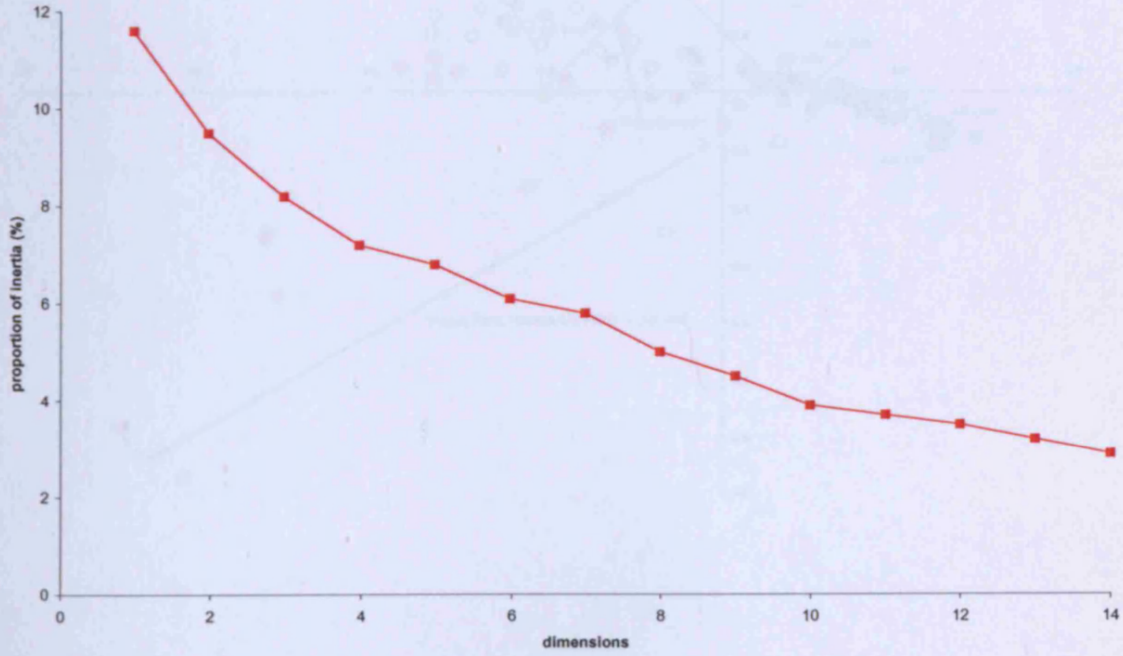


Figure 104: two-dimensional map of bells produced by correspondence analysis of cluster 6d

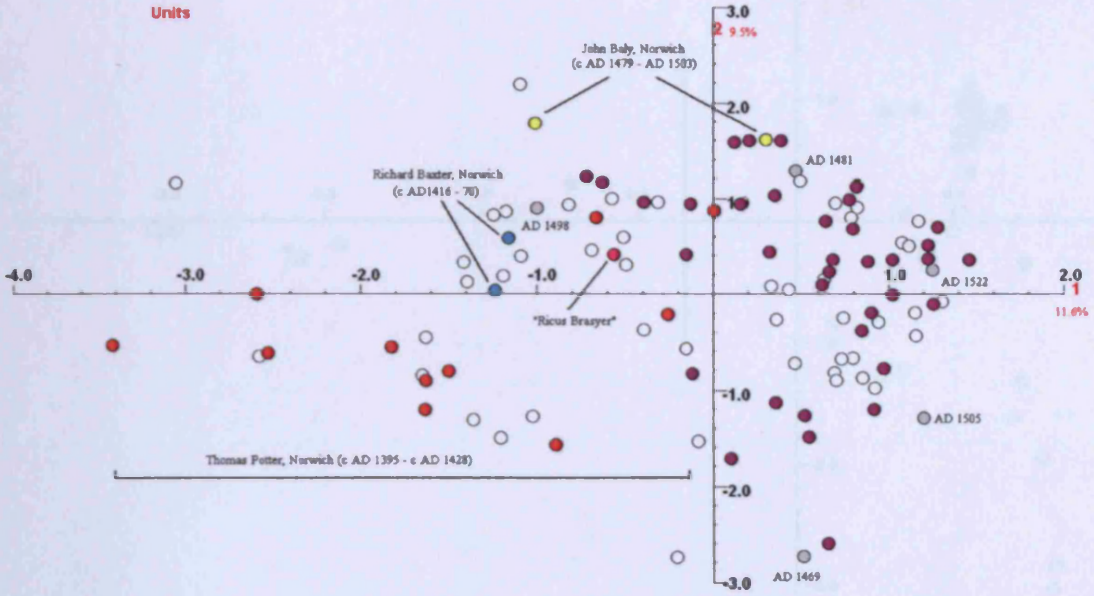


Figure 105: map of bells in dimensions 1 and 3 produced by correspondence analysis of cluster 6d

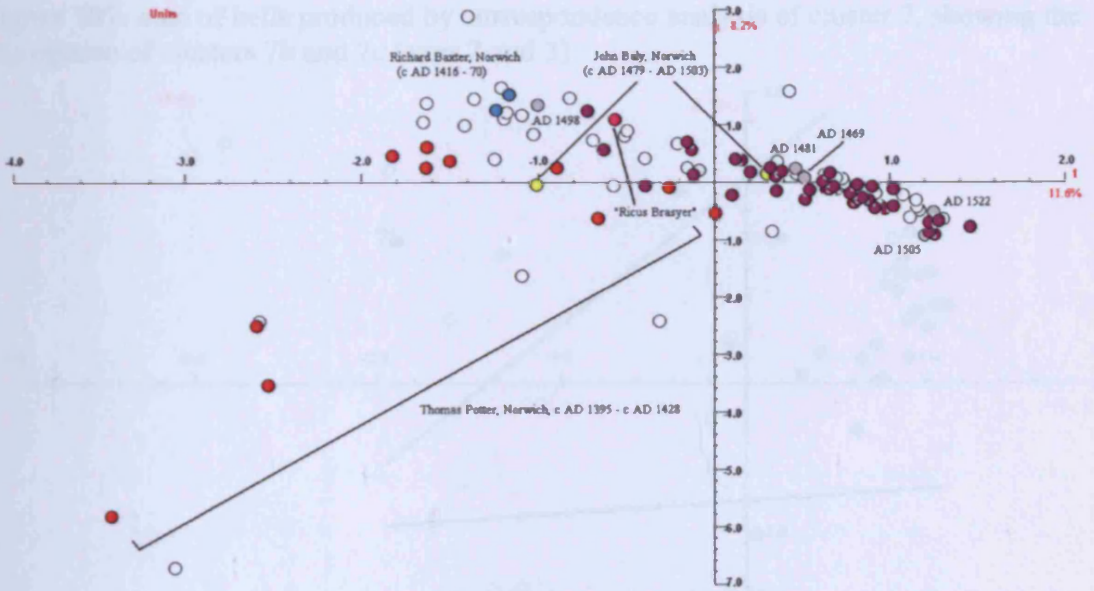


Figure 106: map of bells produced by correspondence analysis of cluster 7, showing the segregation of cluster 7a (axes 1 and 2)

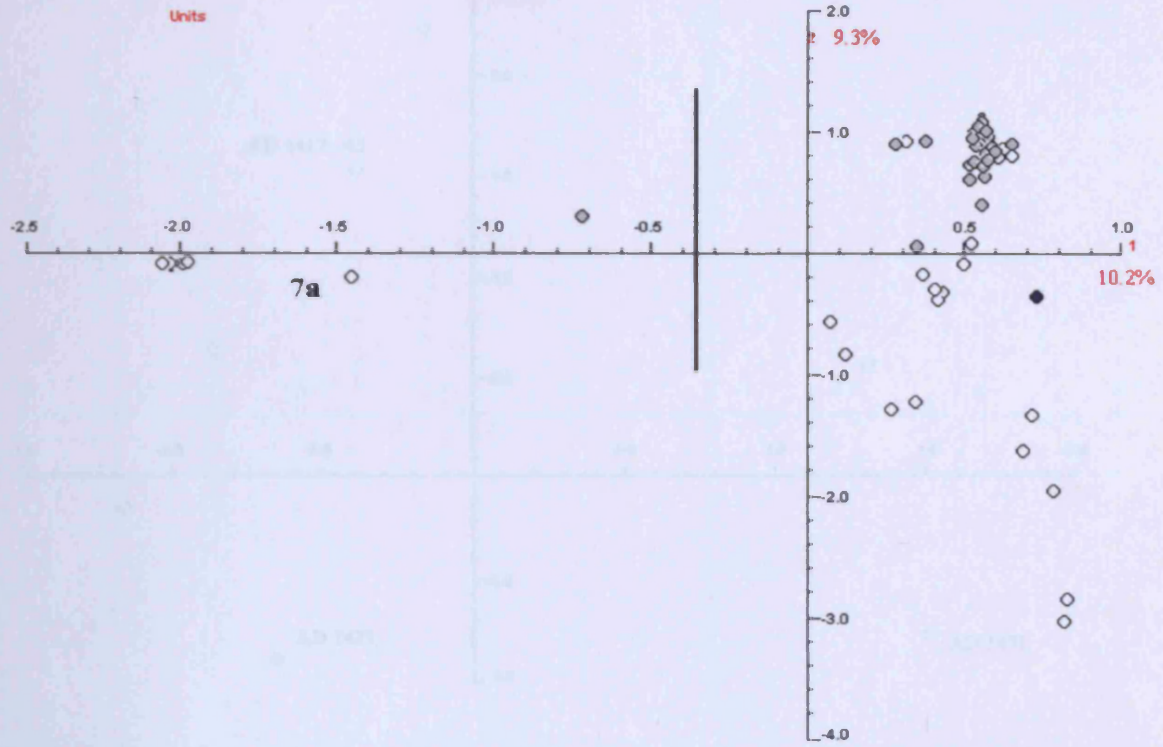


Figure 107: map of bells produced by correspondence analysis of cluster 7, showing the segregation of clusters 7b and 7c (axes 2 and 3)

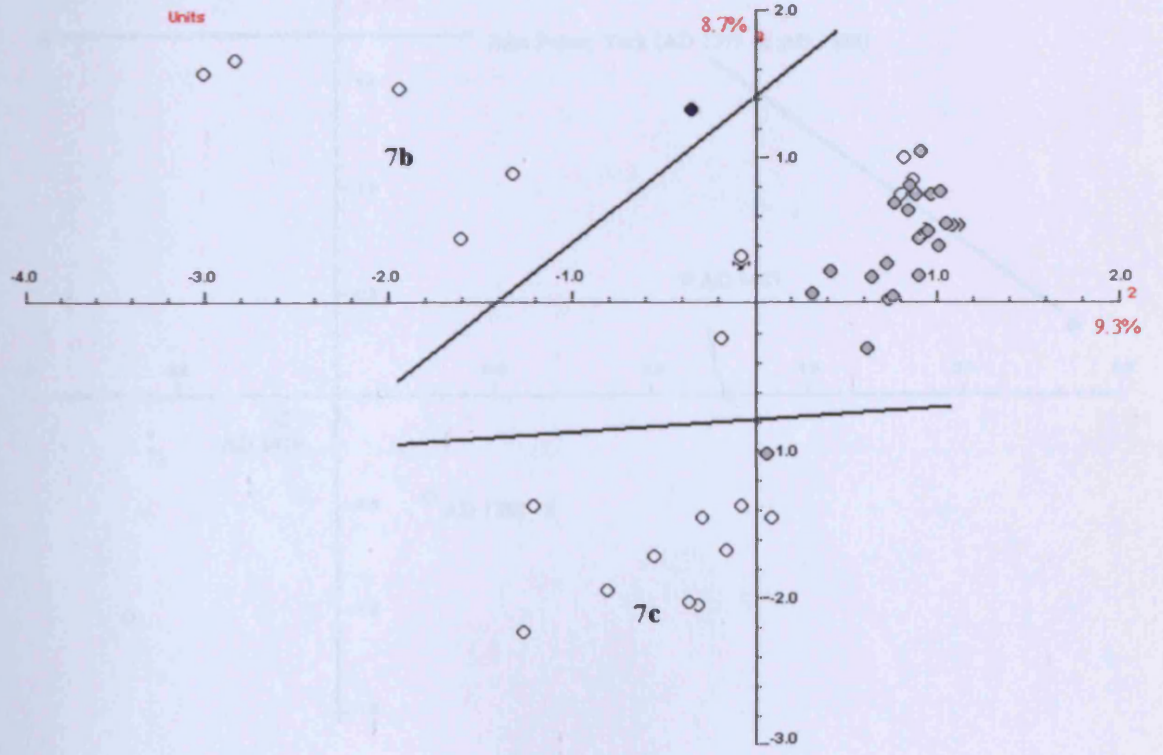


Figure 108: two-dimensional map of bells from correspondence analysis of cluster 7a

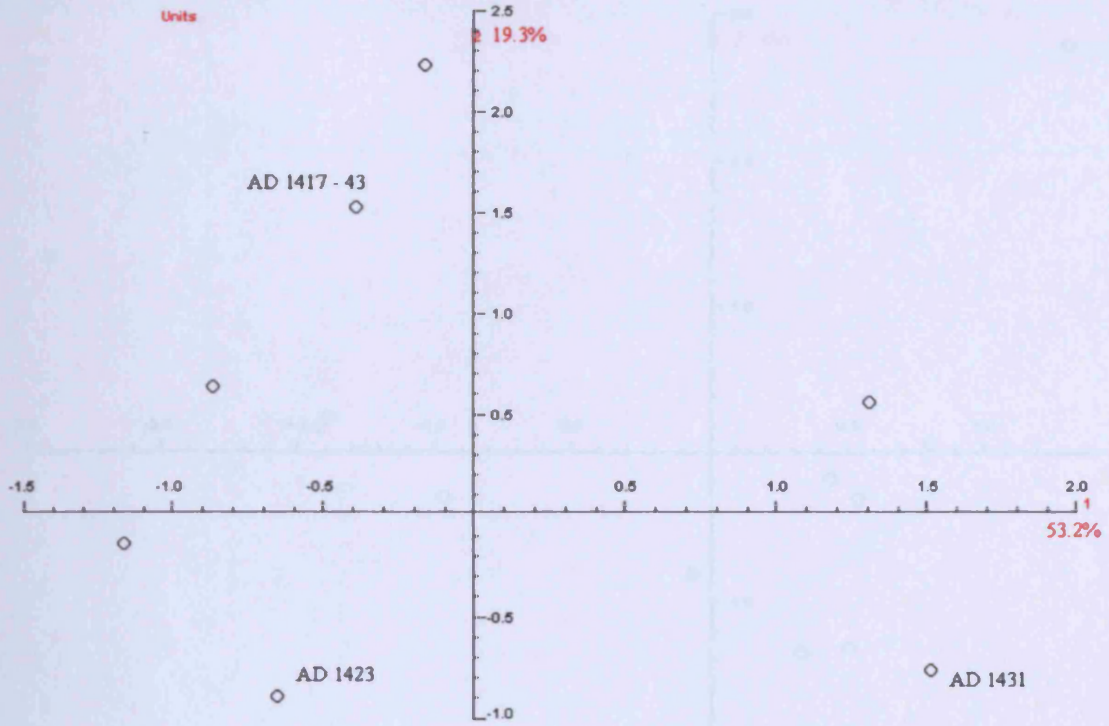


Figure 109: two-dimensional map of bells from correspondence analysis of cluster 7b

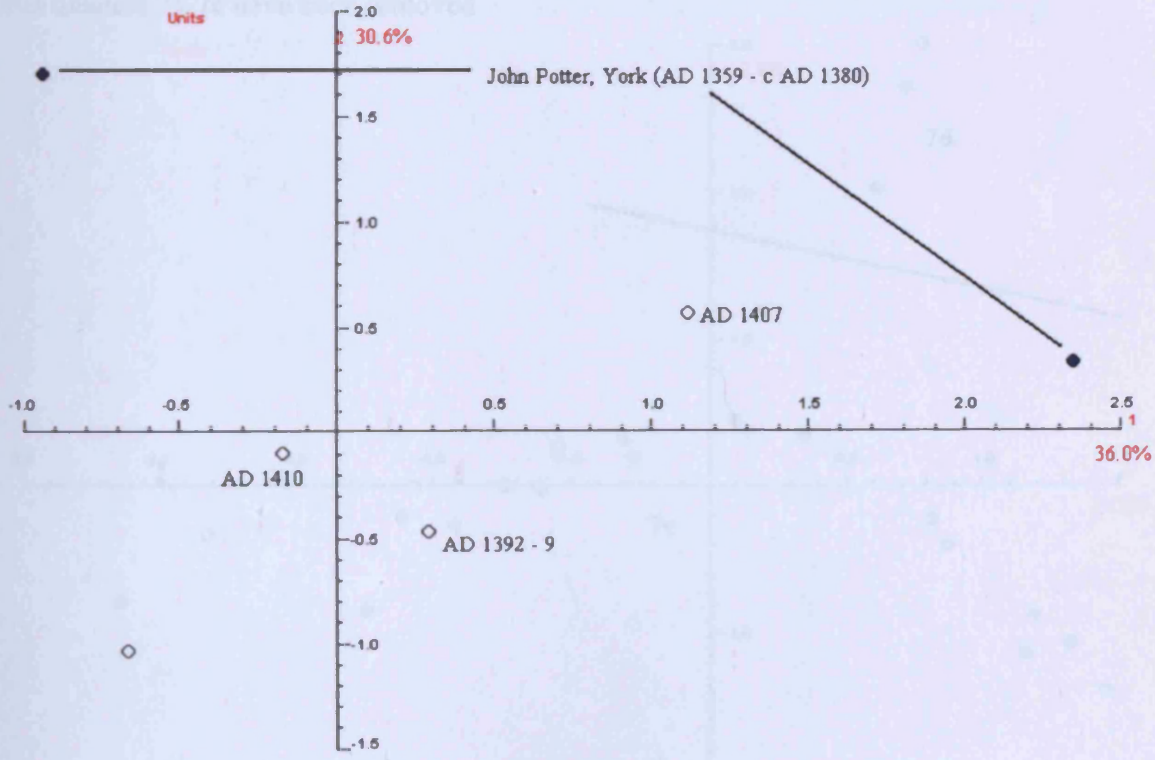


Figure 110: two-dimensional map of bells from correspondence analysis of cluster 7c

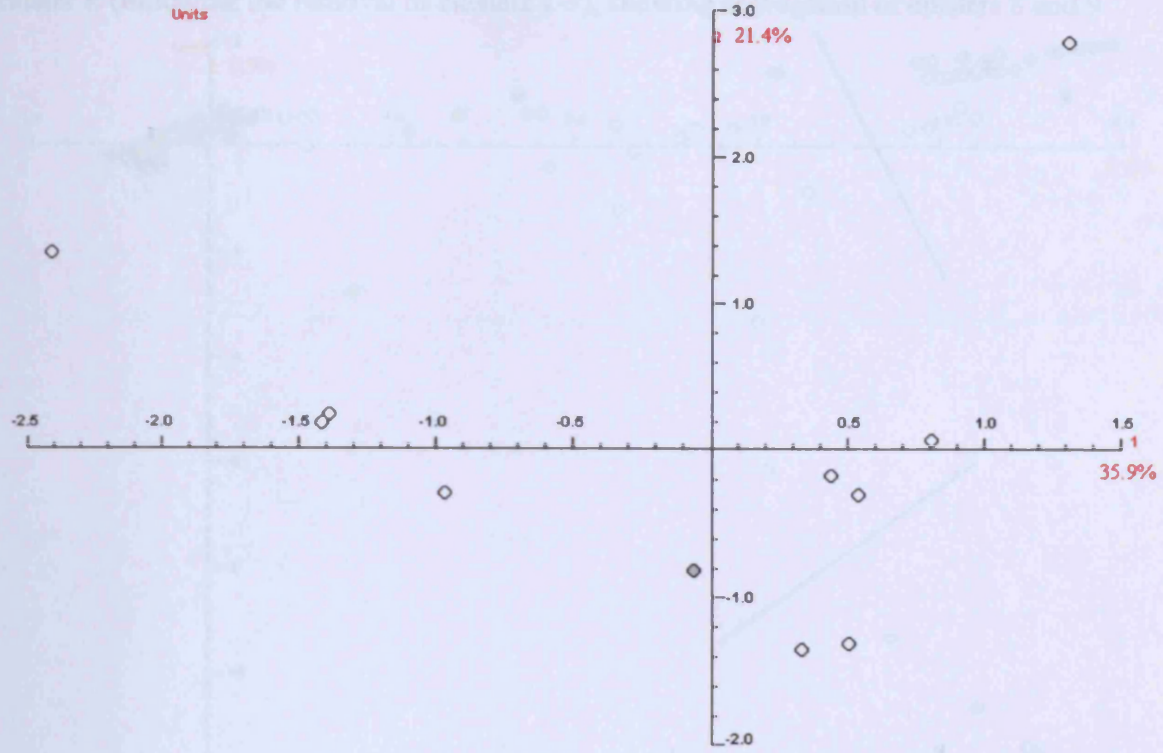


Figure 111: two-dimensional map of bells from correspondence analysis of cluster 7, once clusters 7a-7c have been removed

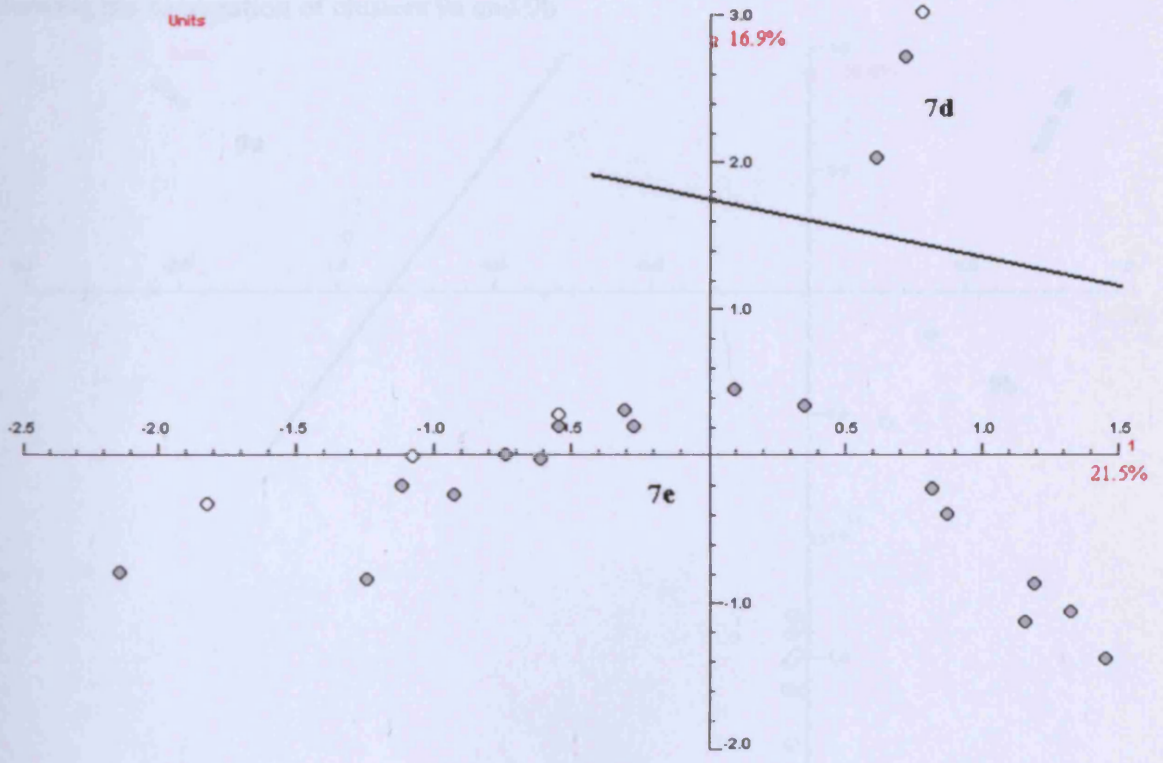


Figure 112: two-dimensional map of bells produced by correspondence analysis of cluster E (following the removal of clusters 1-7), showing segregation of clusters 8 and 9

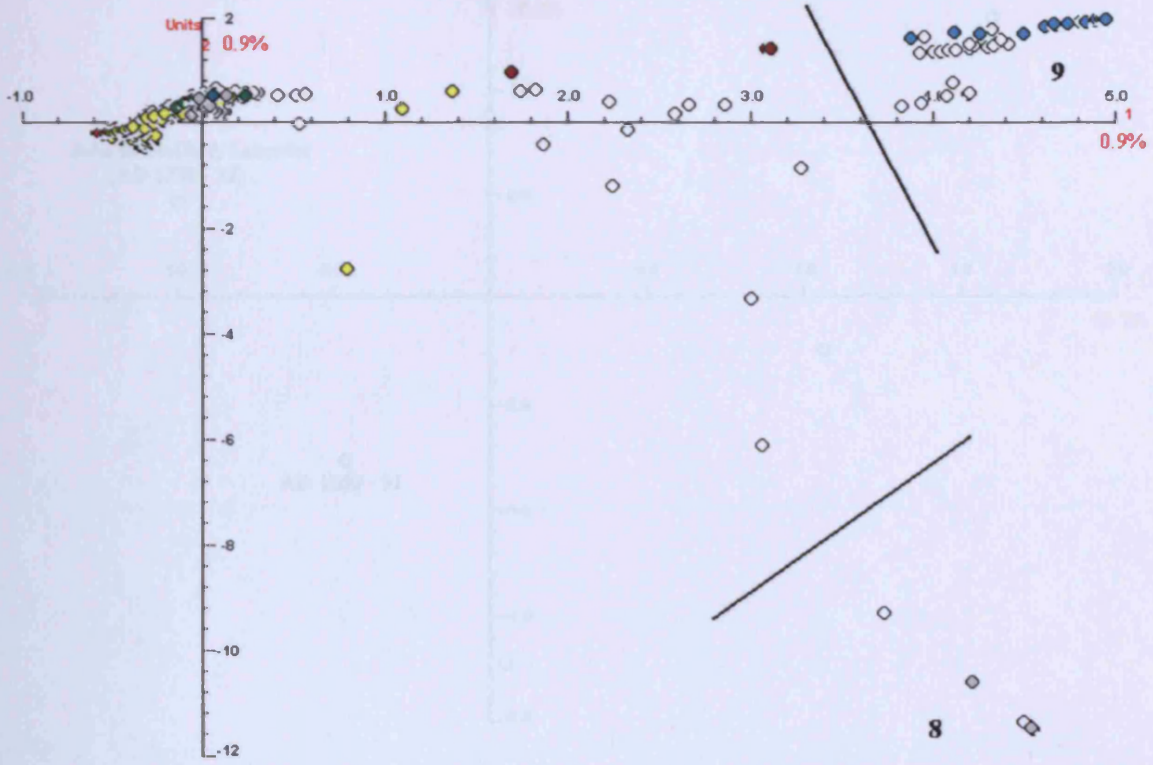


Figure 113: two-dimensional map of bells from correspondence analysis of cluster 9, showing the segregation of clusters 9a and 9b

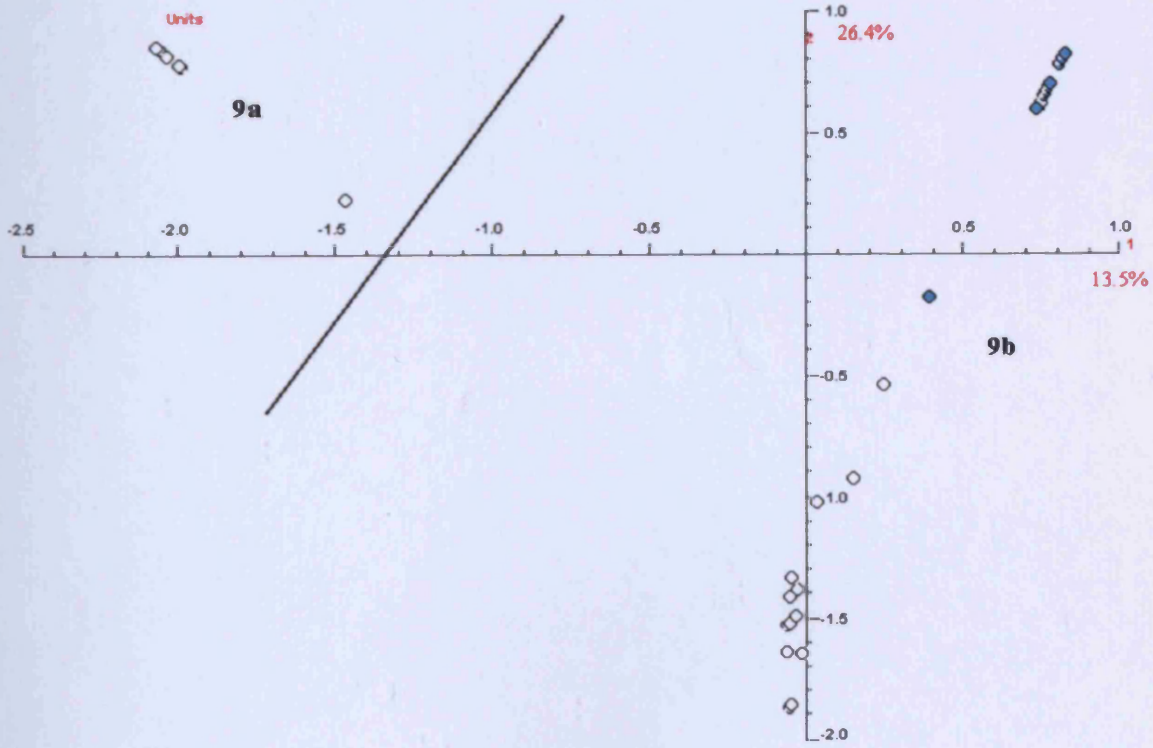


Figure 114: two-dimensional map of bells from correspondence analysis of cluster 9a

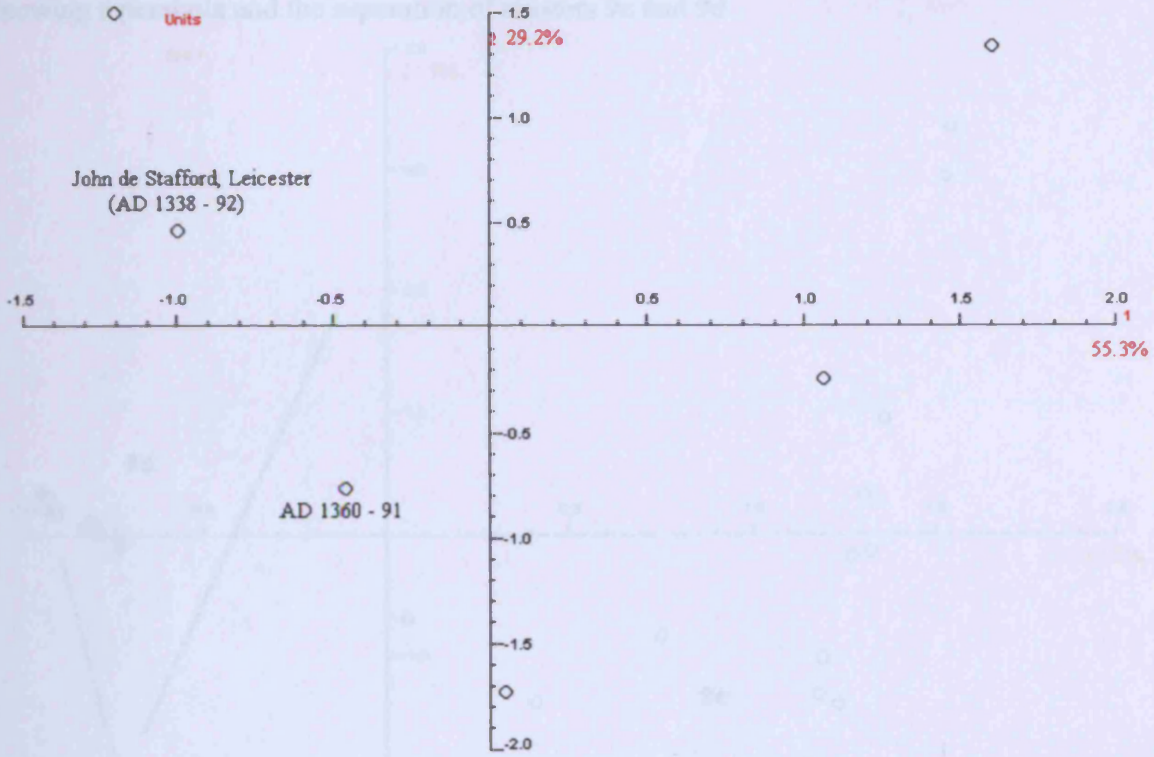


Figure 115: two-dimensional map of bells from correspondence analysis of cluster 9b, showing a parabola and the separation of clusters 9c and 9d

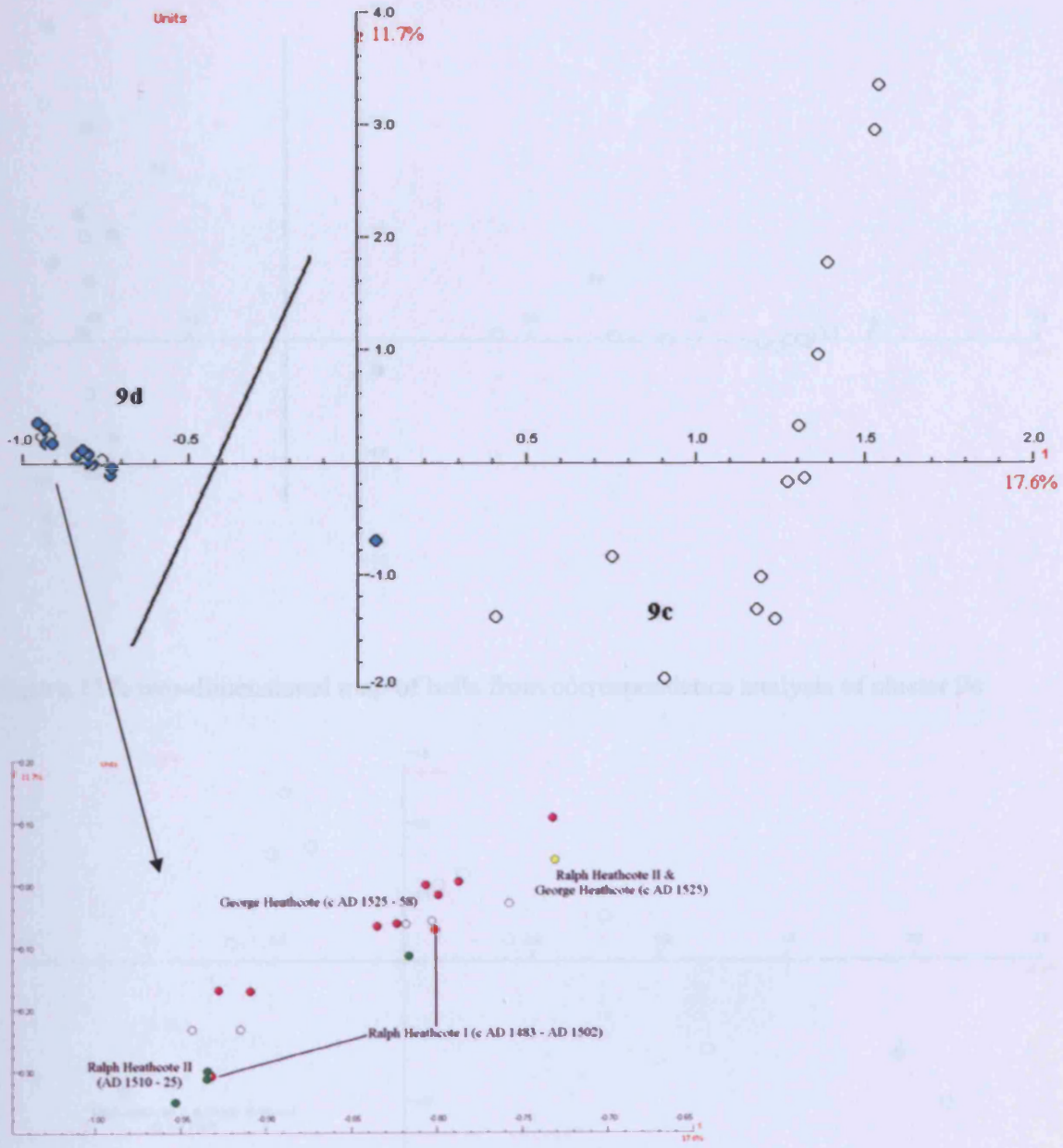


Figure 116: map of bells in dimensions 1 and 3 produced by the correspondence analysis of cluster 9b, showing segregation of clusters 9c and 9d

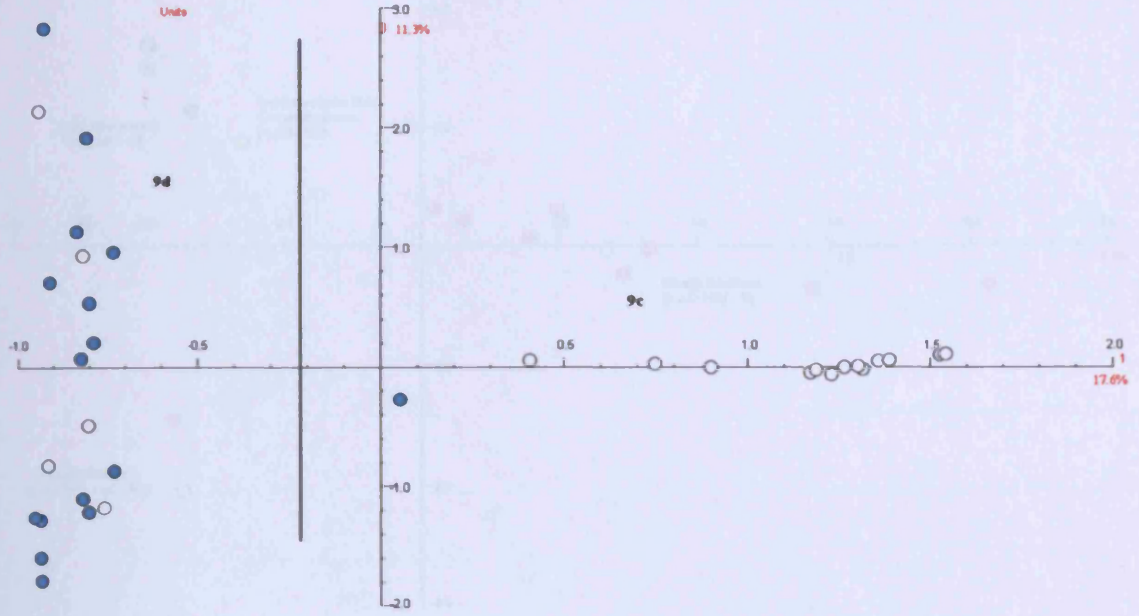


Figure 117: two-dimensional map of bells from correspondence analysis of cluster 9c

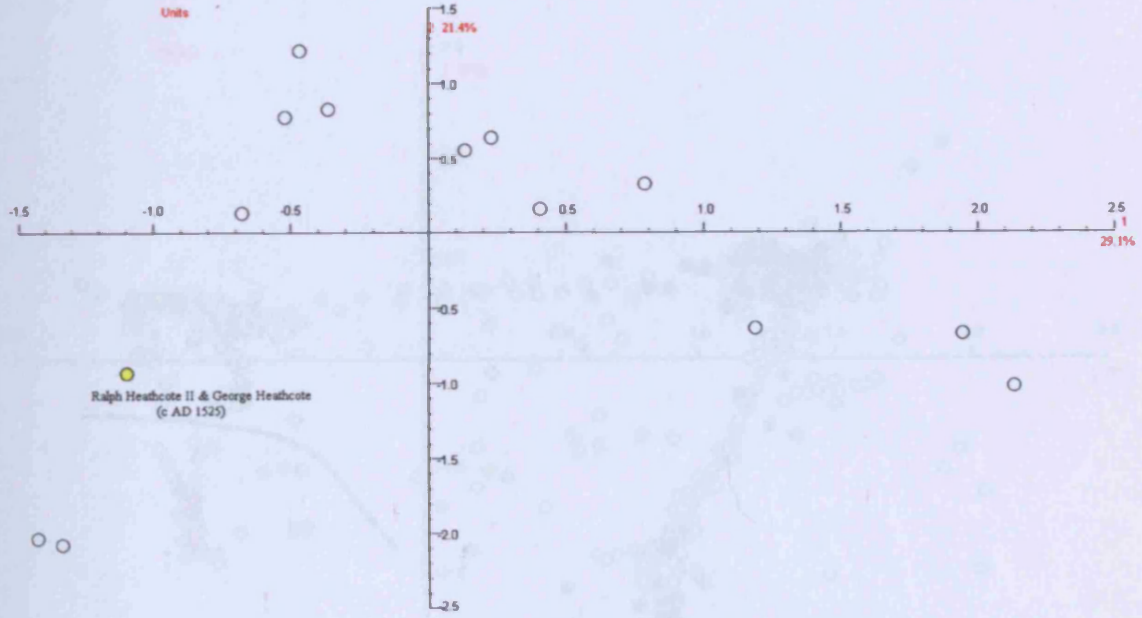


Figure 118: two-dimensional map of bells from correspondence analysis of cluster 9d

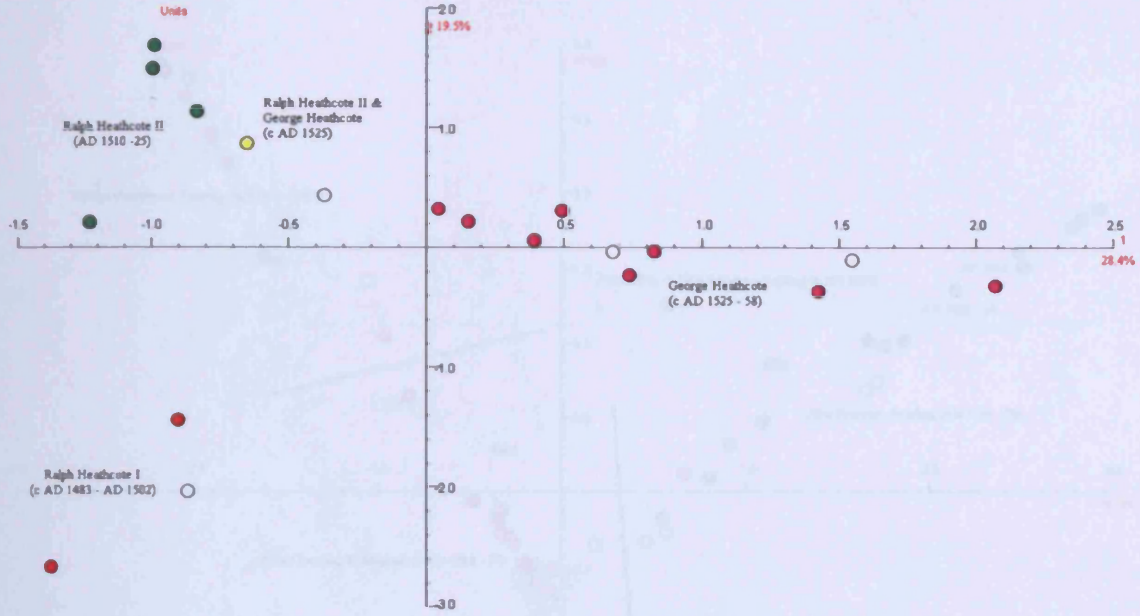


Figure 119: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-9), showing the segregation of cluster 10

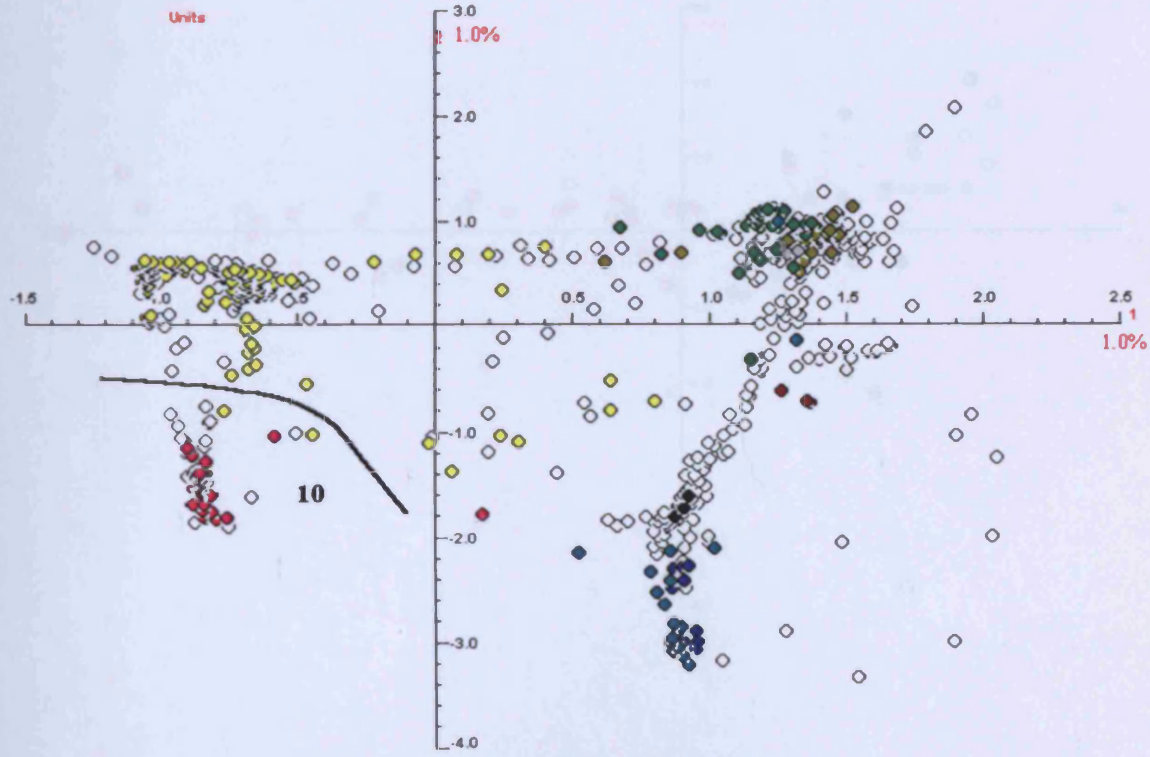


Figure 120: two dimensional map of bells produced by correspondence analysis of cluster 10, showing separation of clusters 10a-c

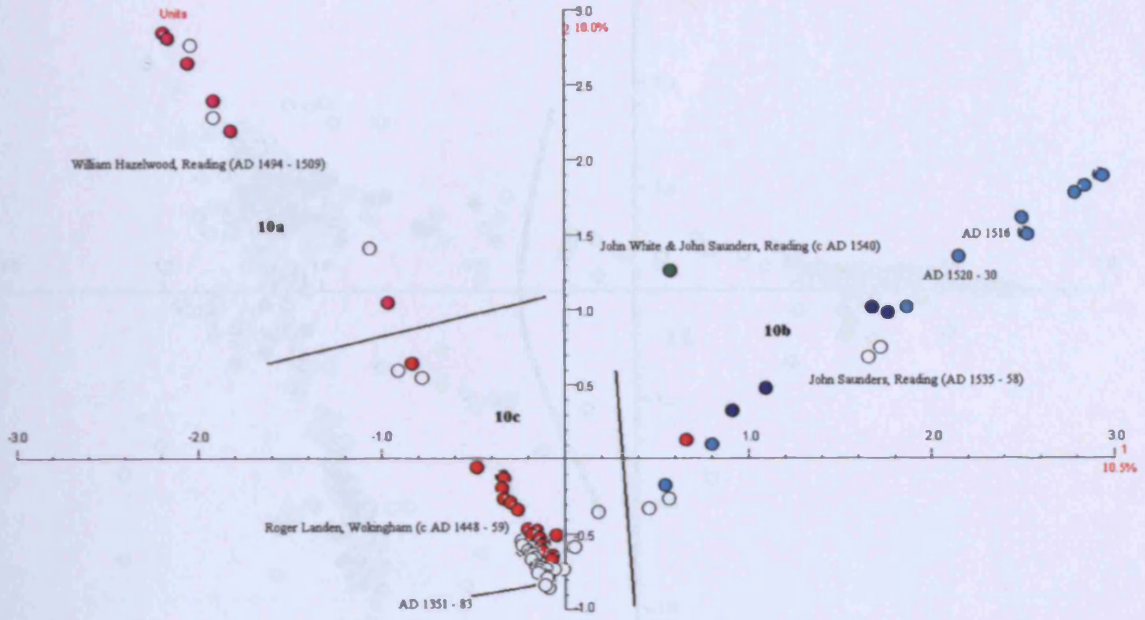


Figure 121: two dimensional map of bells produced by correspondence analysis of cluster 10c

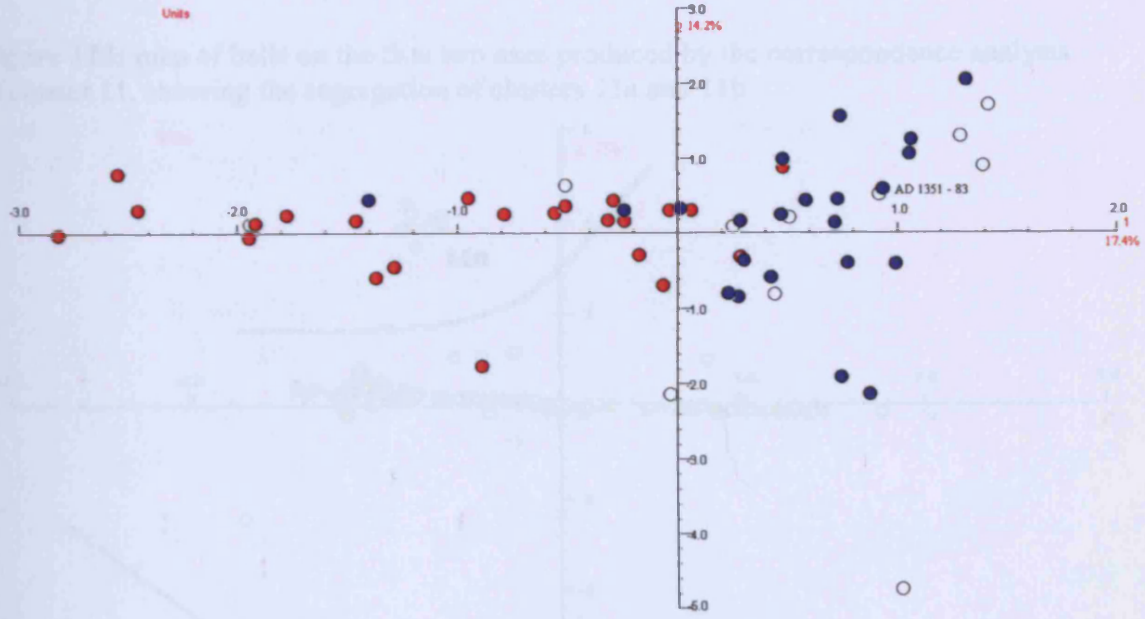


Figure 122: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-10), showing the segregation of cluster 11

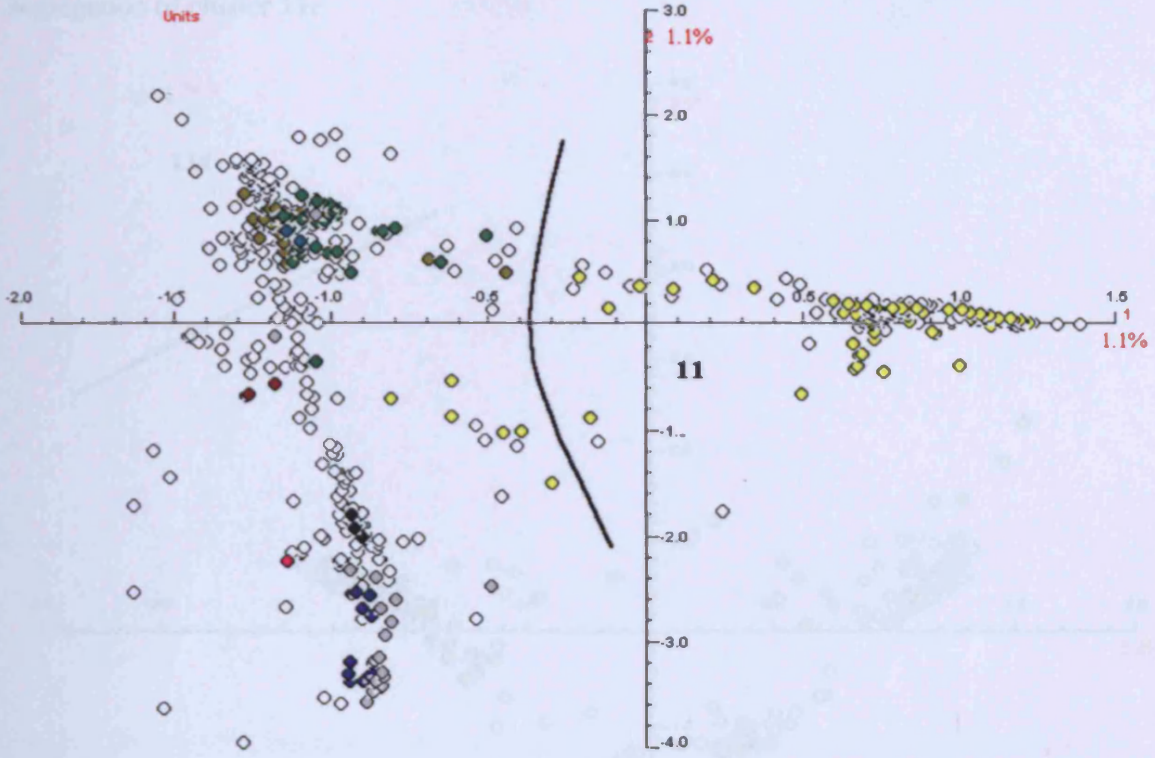


Figure 123: map of bells on the first two axes produced by the correspondence analysis of cluster 11, showing the segregation of clusters 11a and 11b

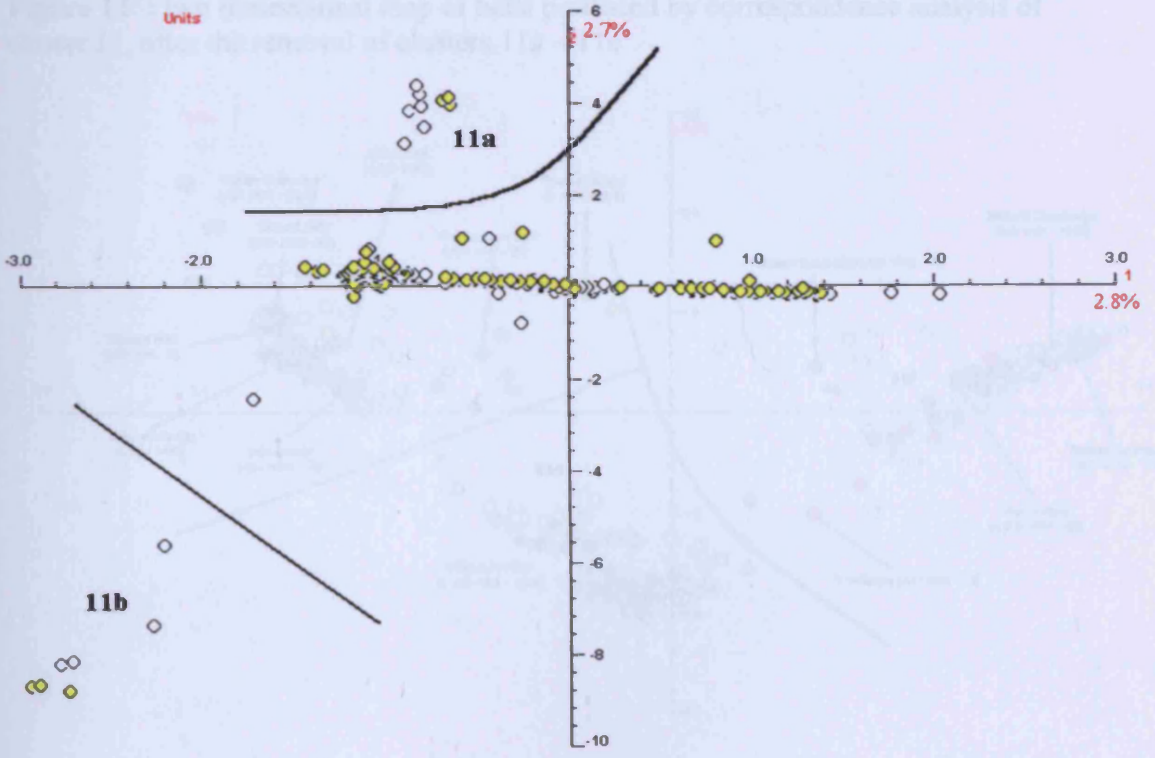


Figure 124: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-10 and clusters 11a-b), showing the segregation of cluster 11c

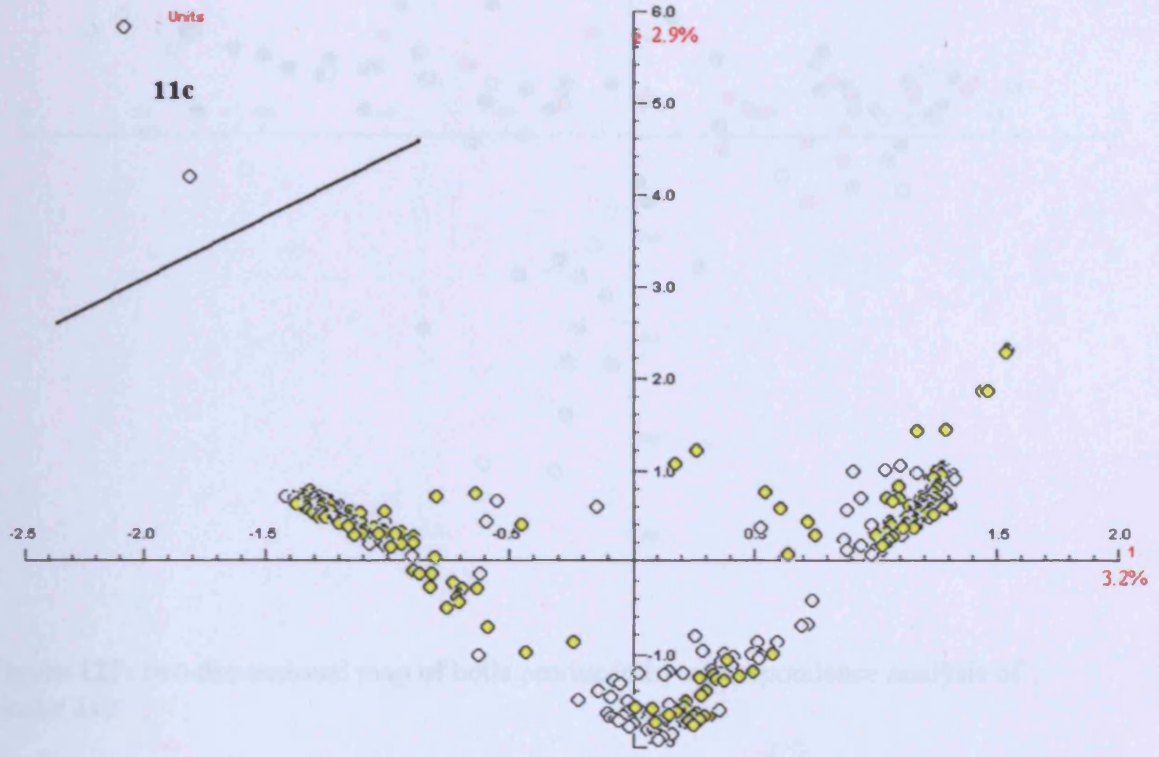


Figure 125: two dimensional map of bells produced by correspondence analysis of cluster 11, after the removal of clusters 11a – 11c

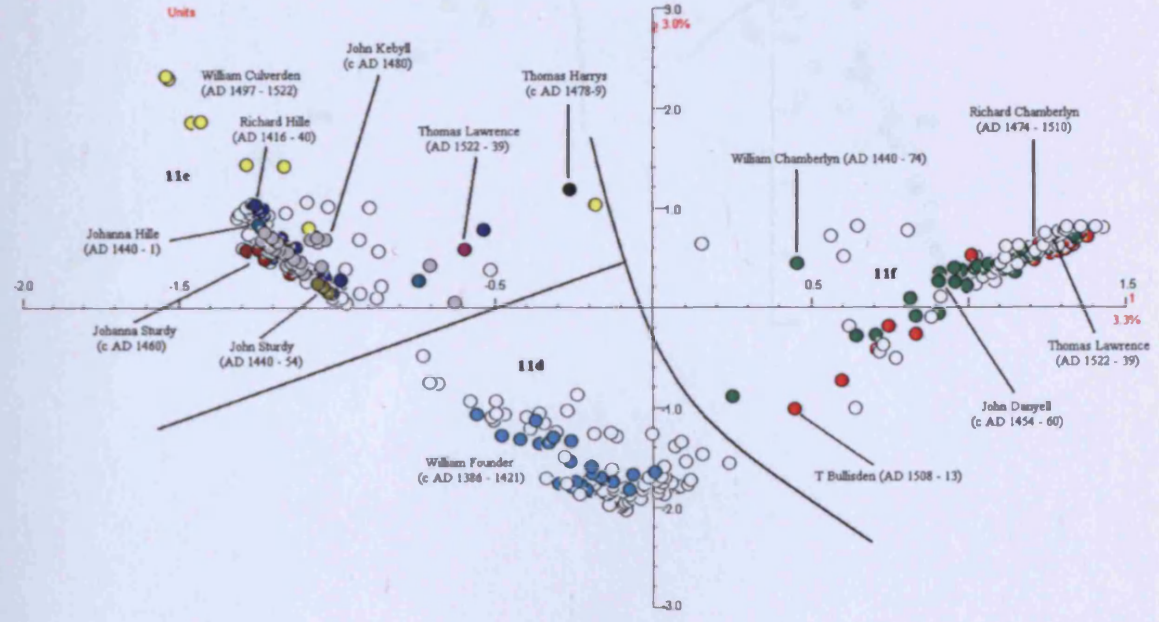


Figure 126: two dimensional map of bells produced by correspondence analysis of cluster 11d

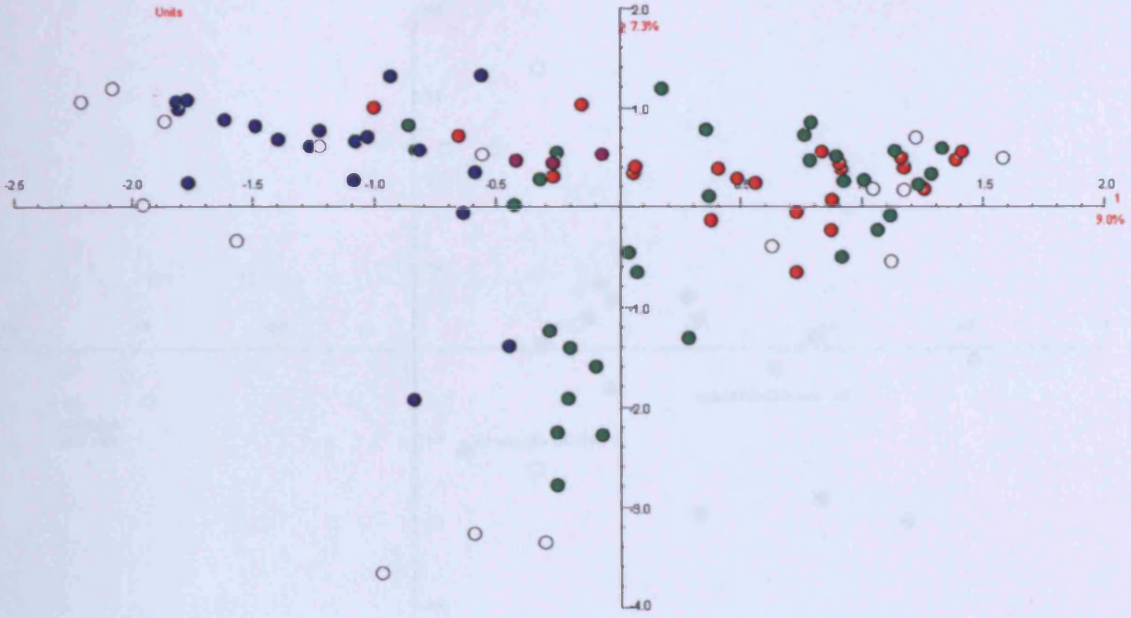


Figure 127: two dimensional map of bells produced by correspondence analysis of cluster 11e

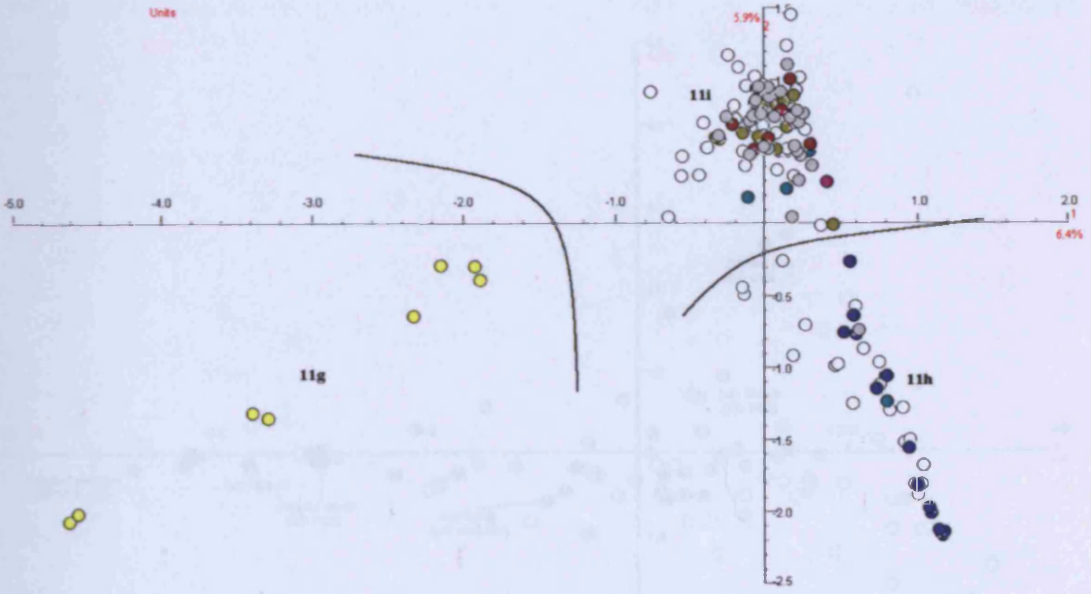


Figure 128: two dimensional map of bells produced by correspondence analysis of cluster 11h

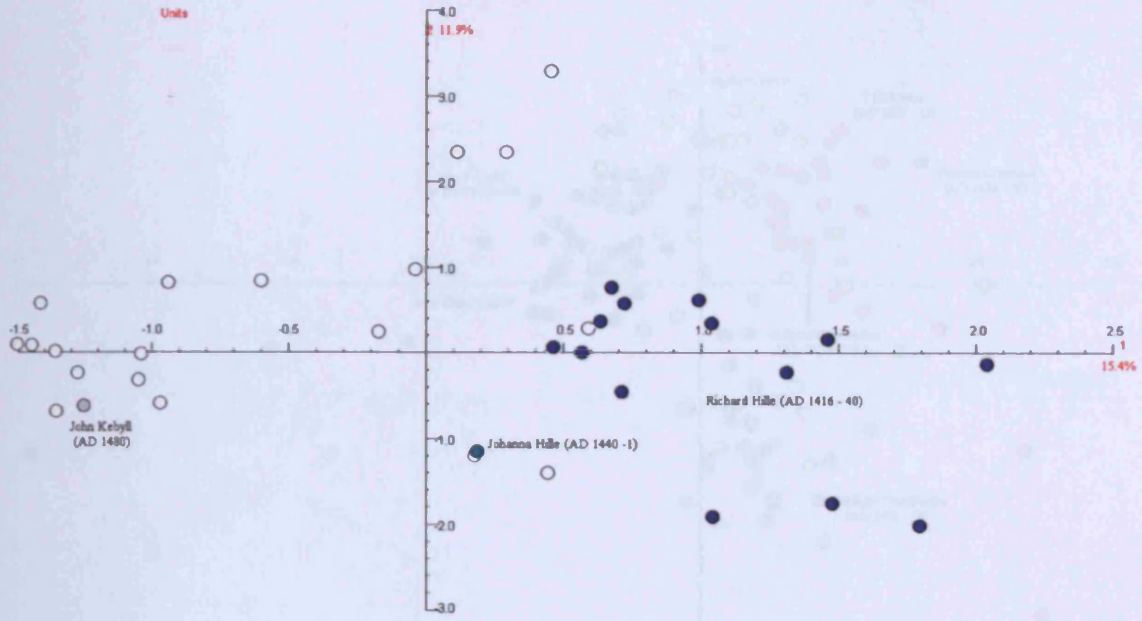


Figure 129: two dimensional map of bells produced by correspondence analysis of cluster 11i

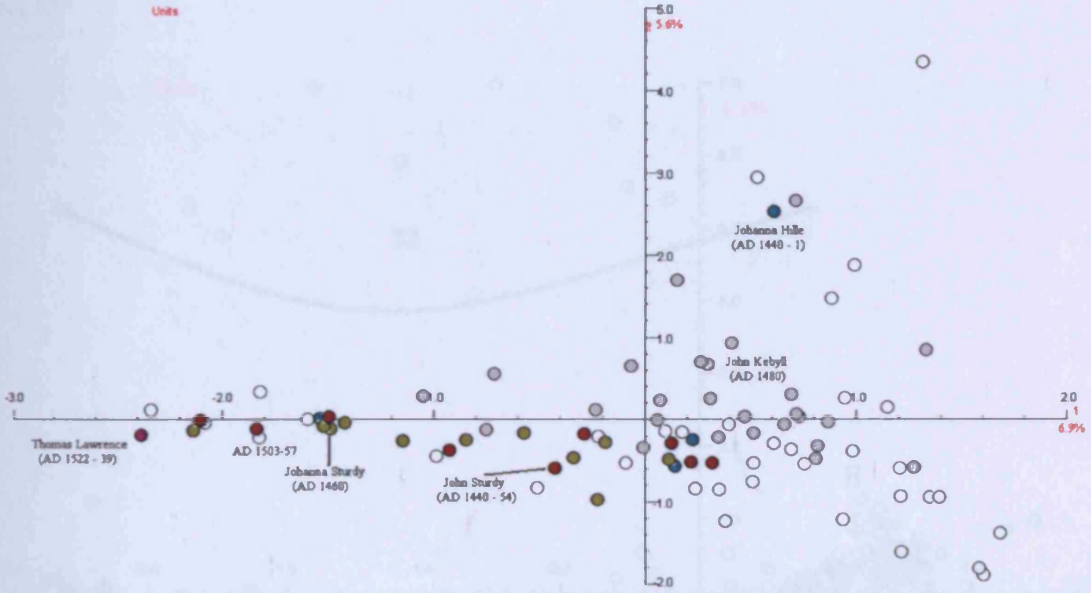


Figure 130: map of bells on the second and third axes produced by correspondence analysis of cluster 11f, showing variation in cluster 11k

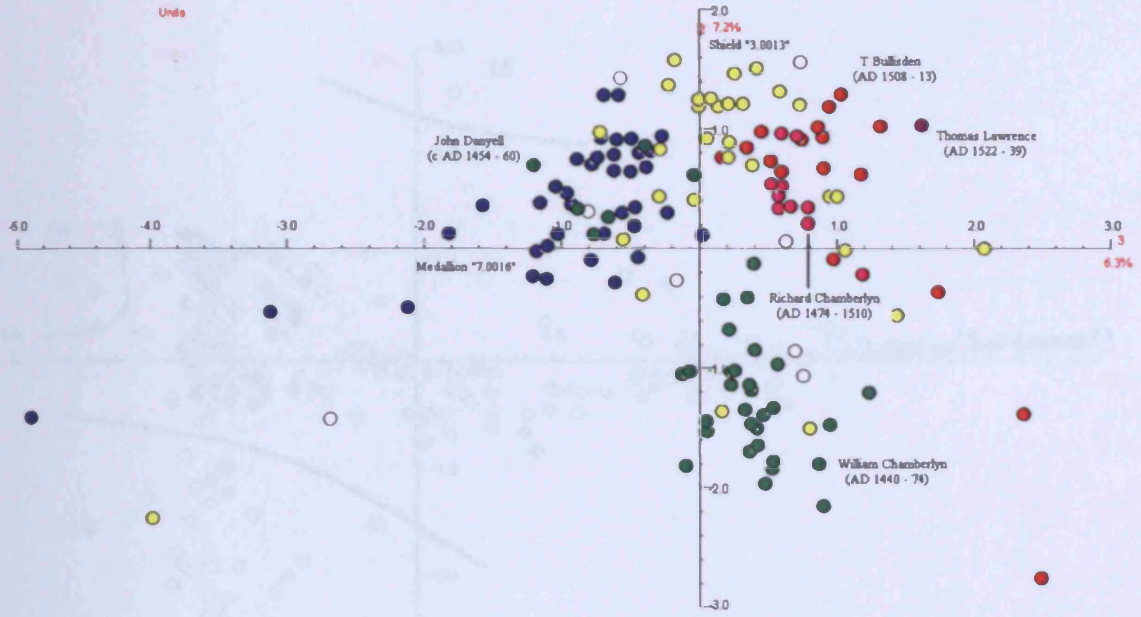


Figure 131: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-11), showing the segregation of clusters 12 and 13

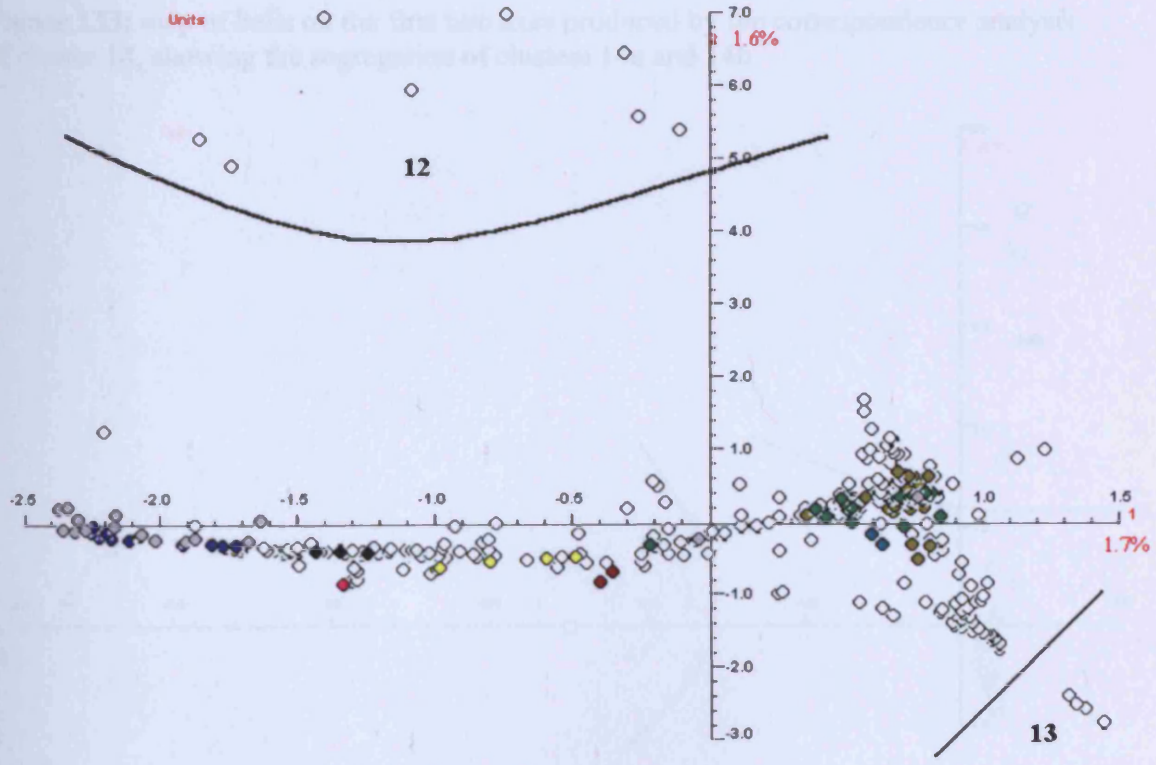


Figure 132: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-13), showing the segregation of clusters 14-16

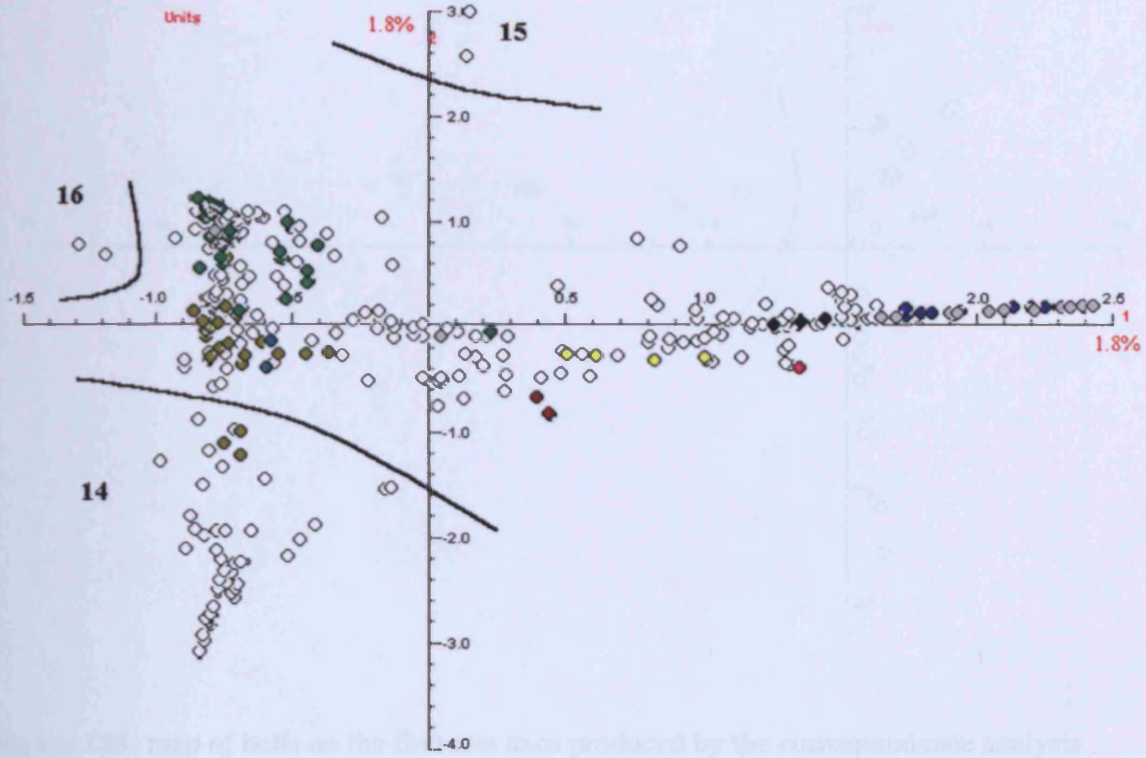


Figure 133: map of bells on the first two axes produced by the correspondence analysis of cluster 14, showing the segregation of clusters 14a and 14b

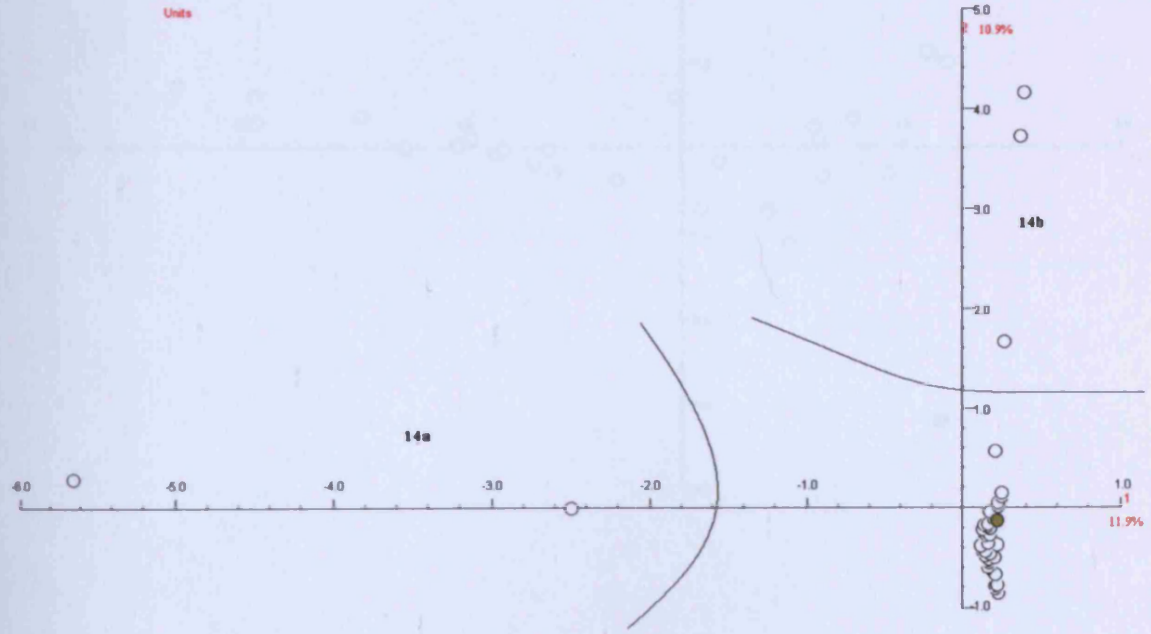


Figure 134: map of bells on the first two axes produced by the correspondence analysis of cluster 14 (once clusters 14a and 14b have been removed), showing the division of clusters 14c and 14d

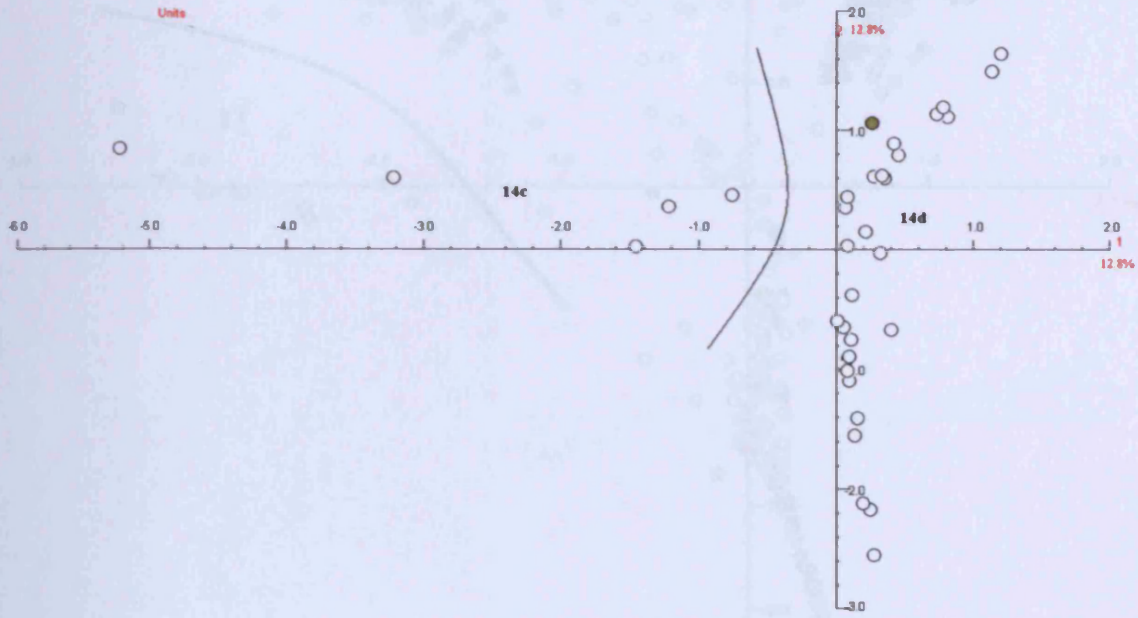


Figure 135: map of bells on the first two axes produced by the correspondence analysis of cluster 14d

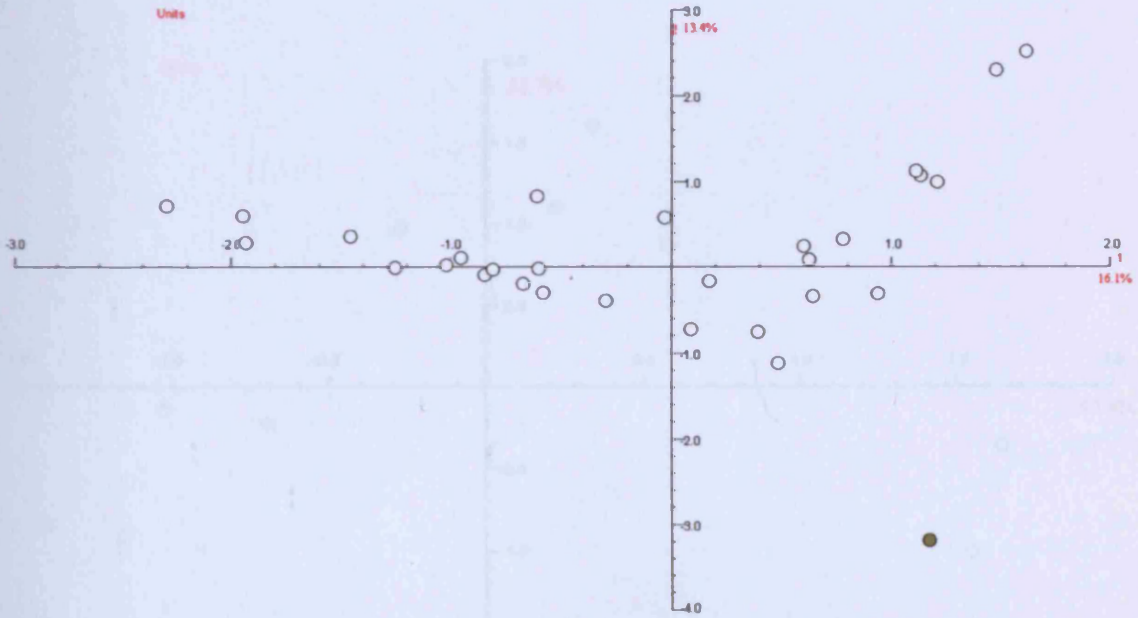


Figure 136: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-16), showing the segregation of cluster 17

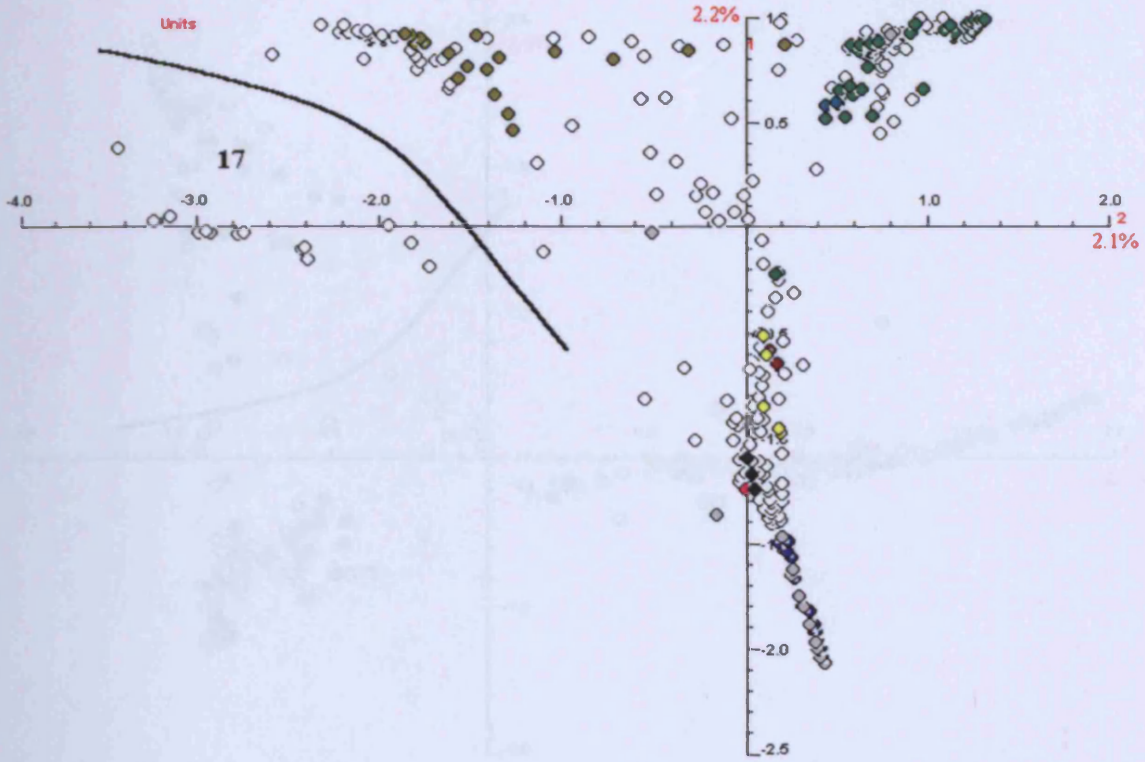


Figure 137: map of bells on the first two axes produced by the correspondence analysis of cluster 17

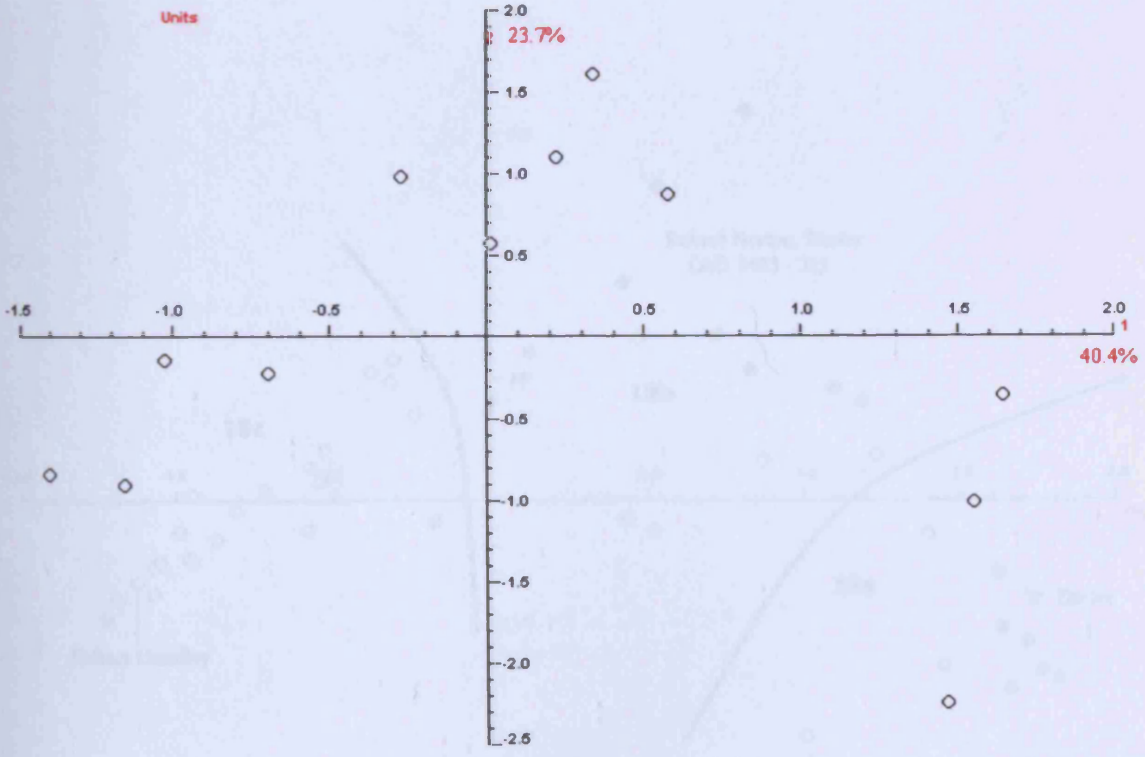


Figure 138: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-17), showing the segregation of cluster 18

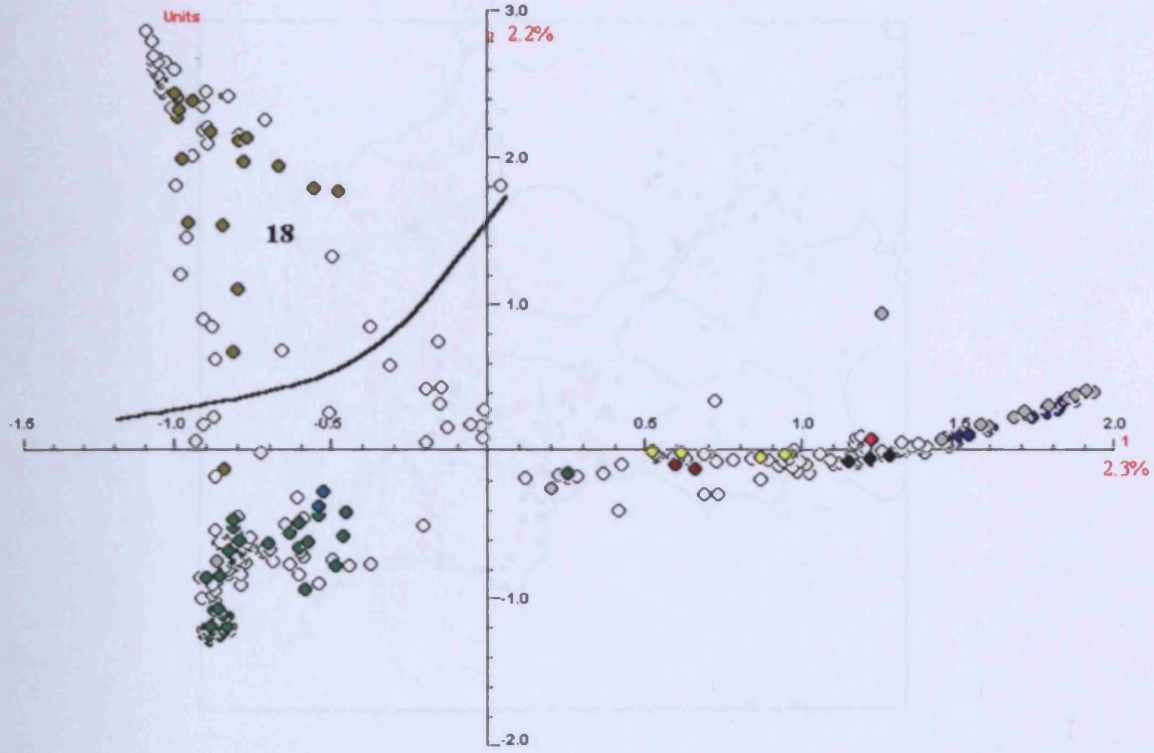


Figure 139: map of bells on the first two axes produced by the correspondence analysis of cluster 18, showing the partition of clusters 18a-c

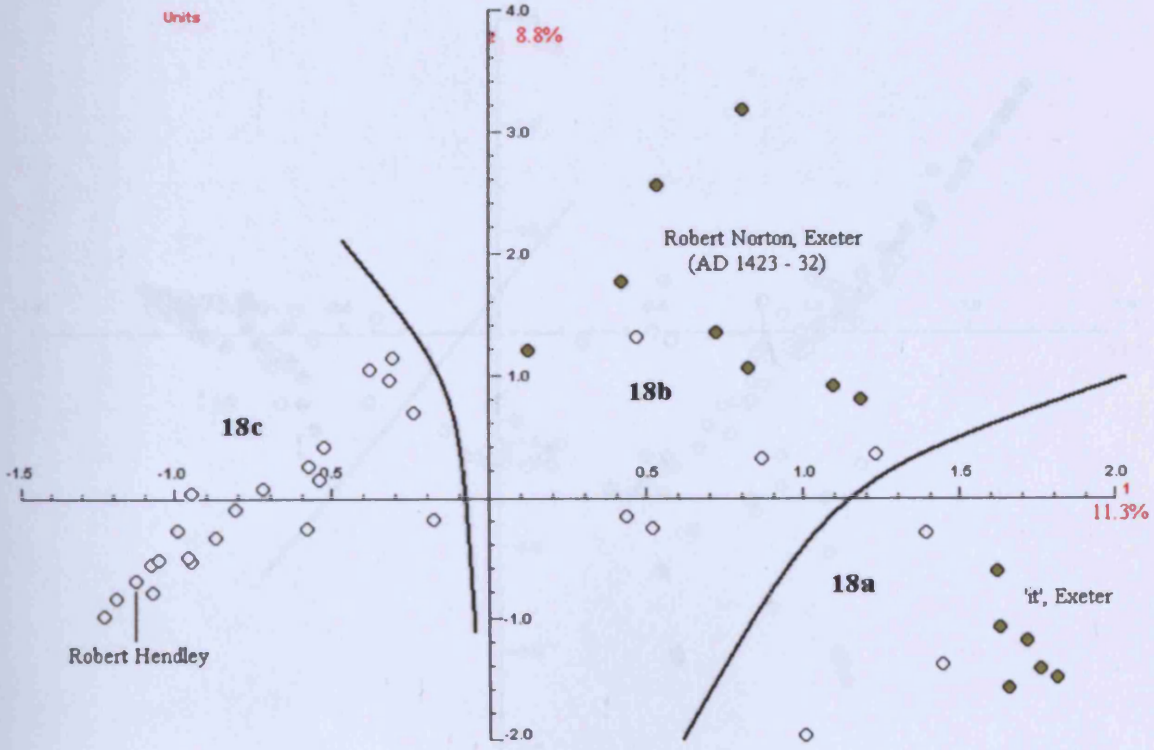


Figure 140: location map of bells in clusters 18a (black), 18b (red), and 18c (green) (bells identical to those in the reduced incidence matrix have been included from the complete incidence matrix)

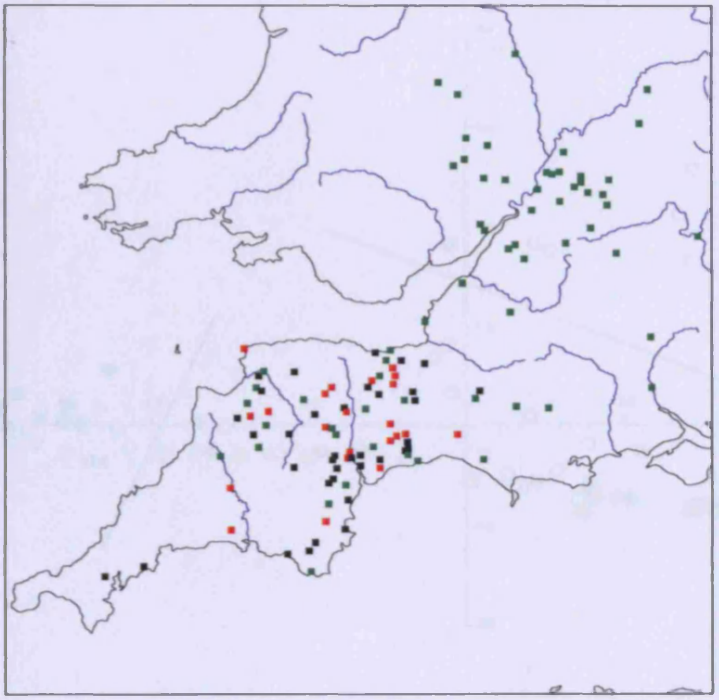


Figure 141: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-18), showing the segregation of cluster 19

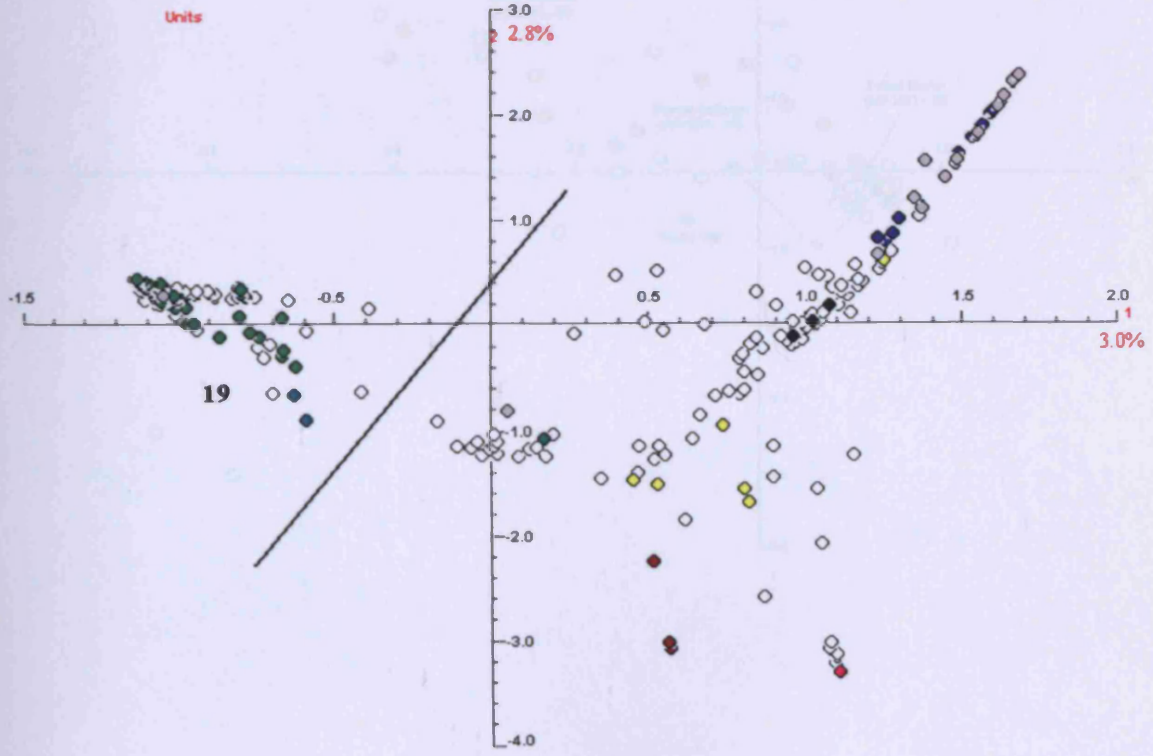


Figure 142: map of bells on the first two axes produced by the correspondence analysis of cluster 19 (once cluster 19a has been removed), showing the partition of clusters 19b-19e

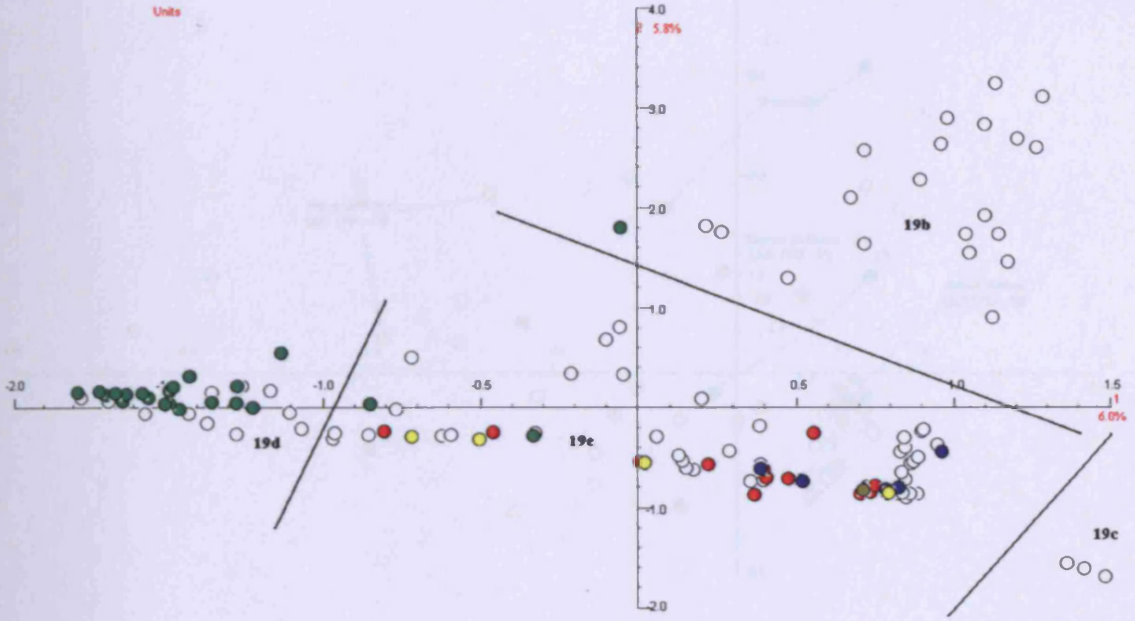


Figure 143: map of bells on the first two axes produced by the correspondence analysis of cluster 19e

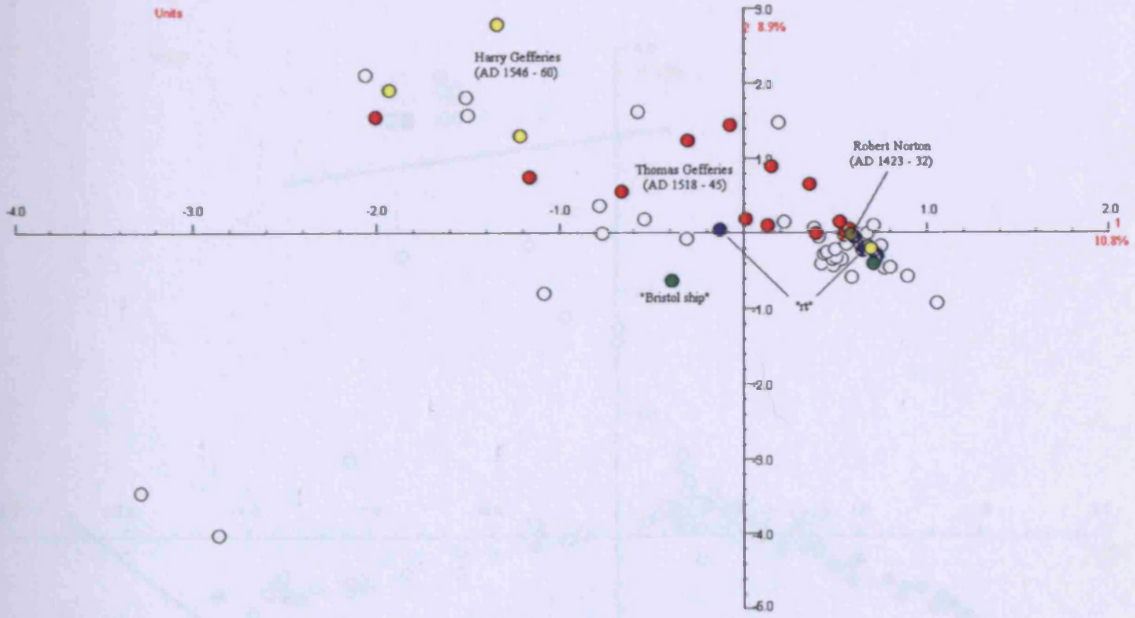


Figure 144: map of bells against the first and third axes produced by the correspondence analysis of cluster 19e

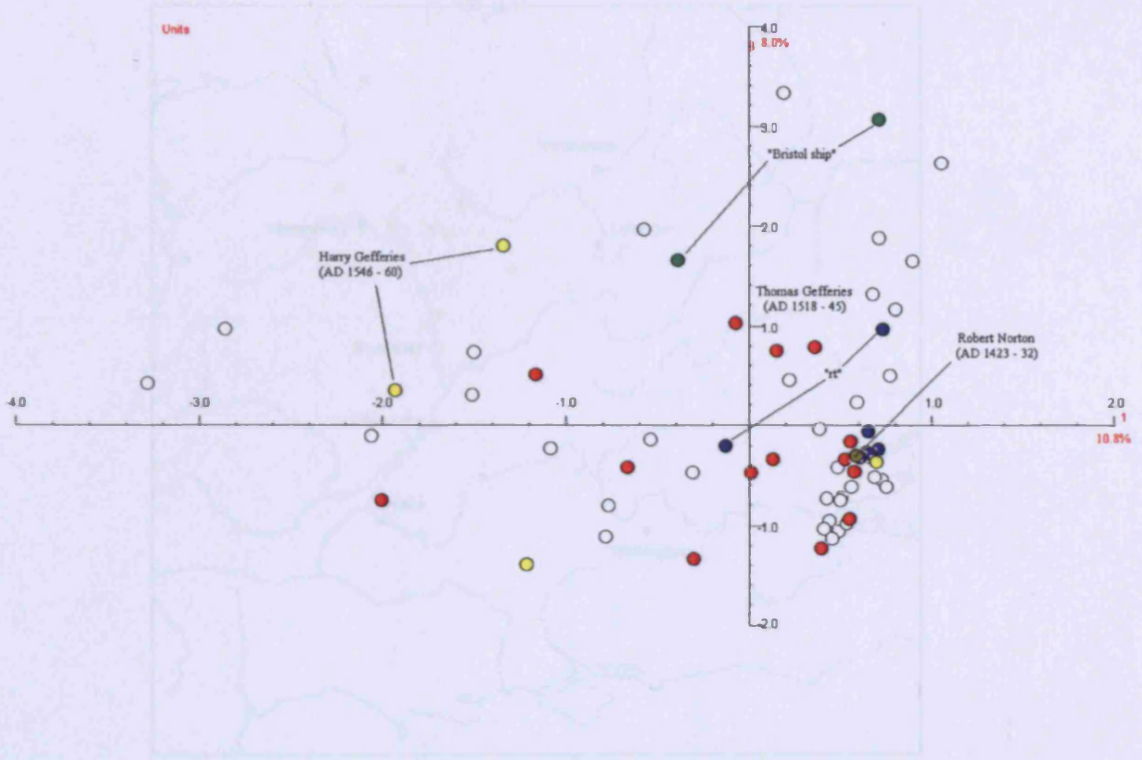


Figure 145: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-19), showing the segregation of clusters 20 and 21

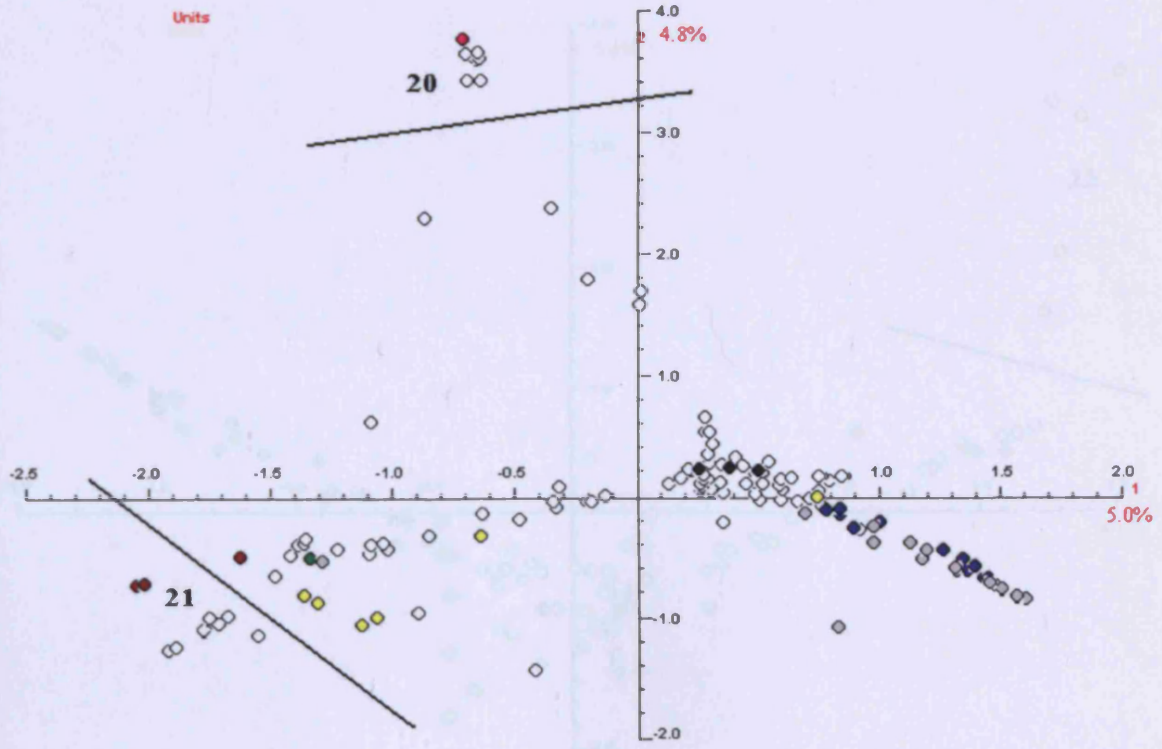


Figure 146: location map of bells in cluster 20 (bells identical to those in the reduced incidence matrix have been included from the complete incidence matrix)

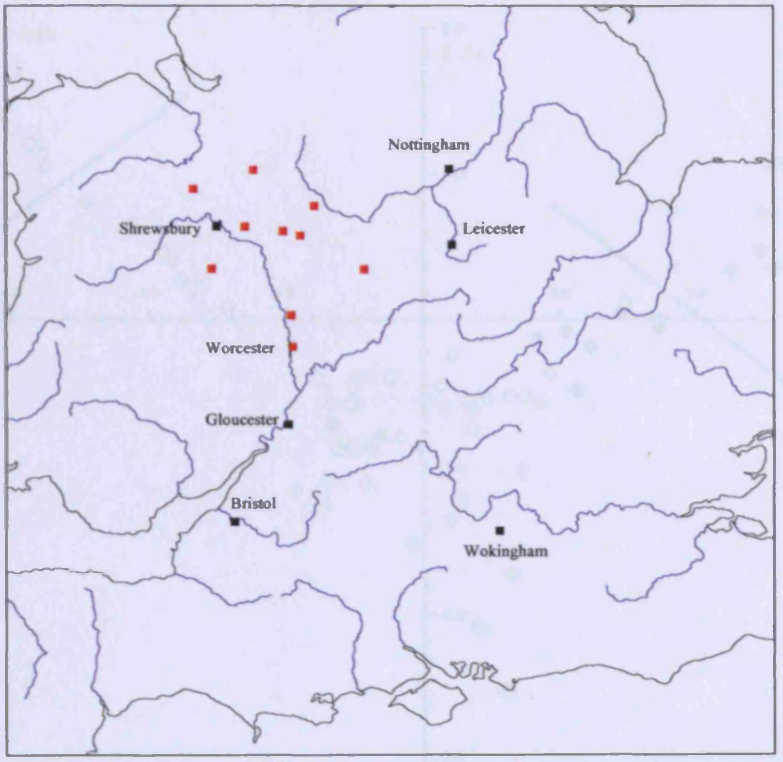


Figure 147: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-21), showing the segregation of cluster 22

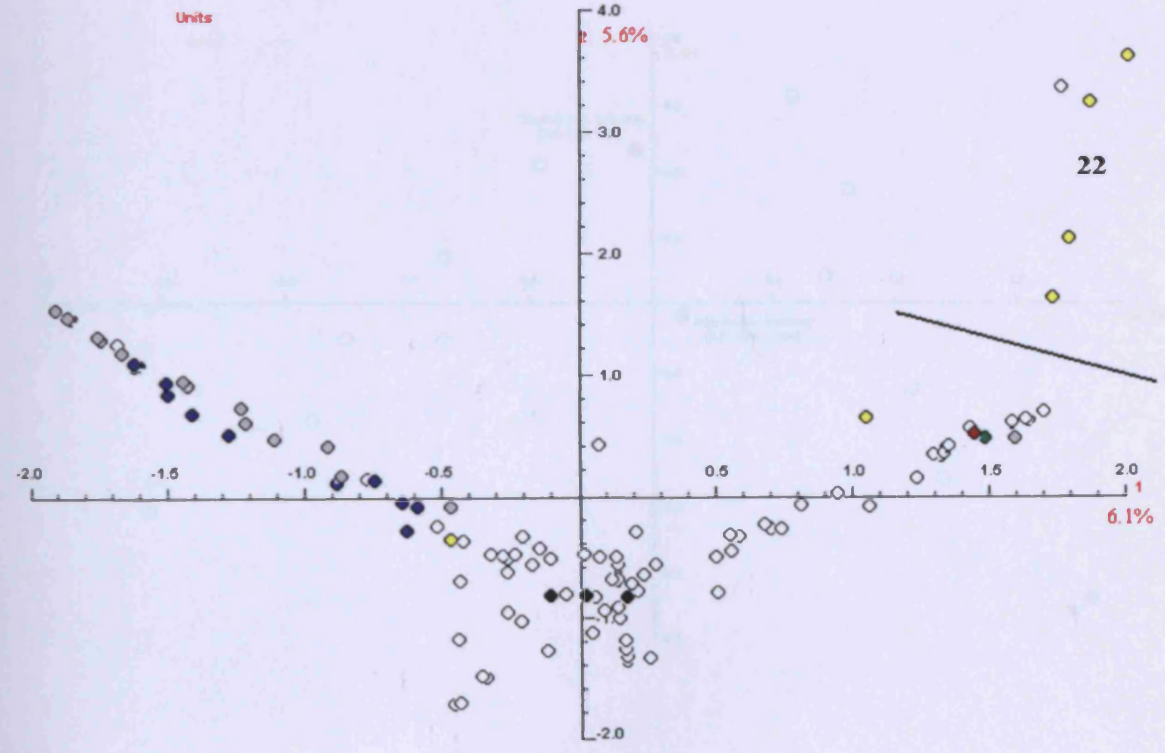


Figure 148: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-22), showing the segregation of clusters 23 and 24

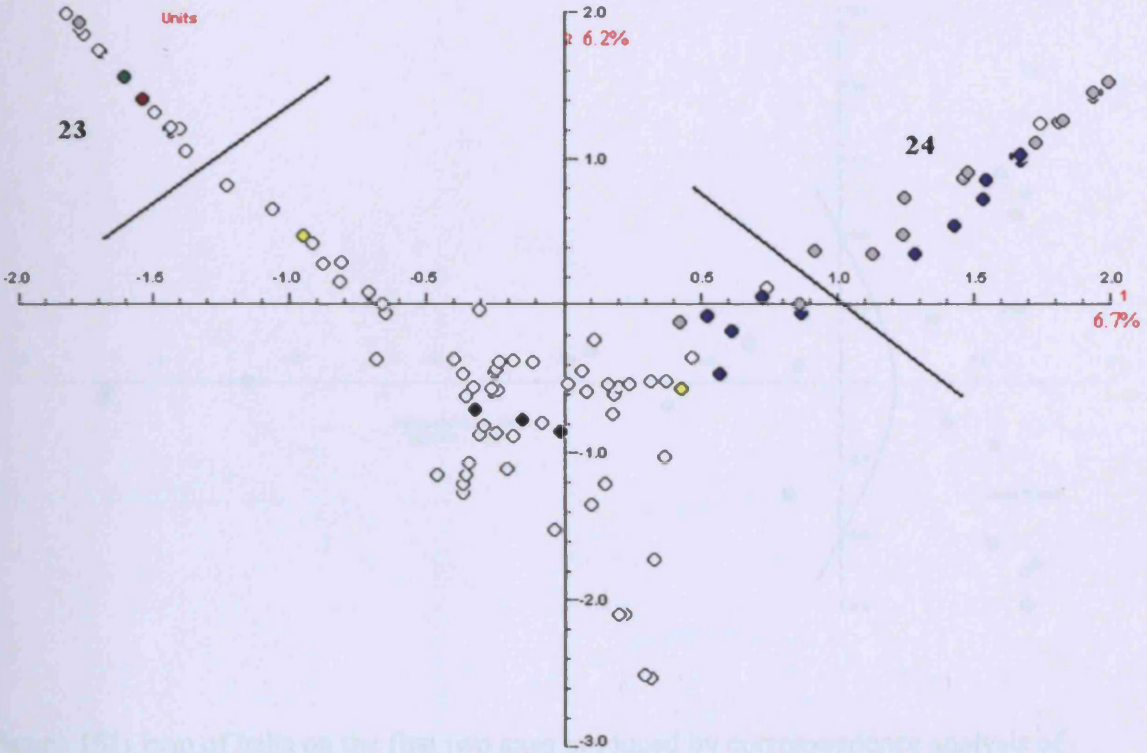


Figure 149: map of bells on the first two axes produced by the correspondence analysis of cluster 23

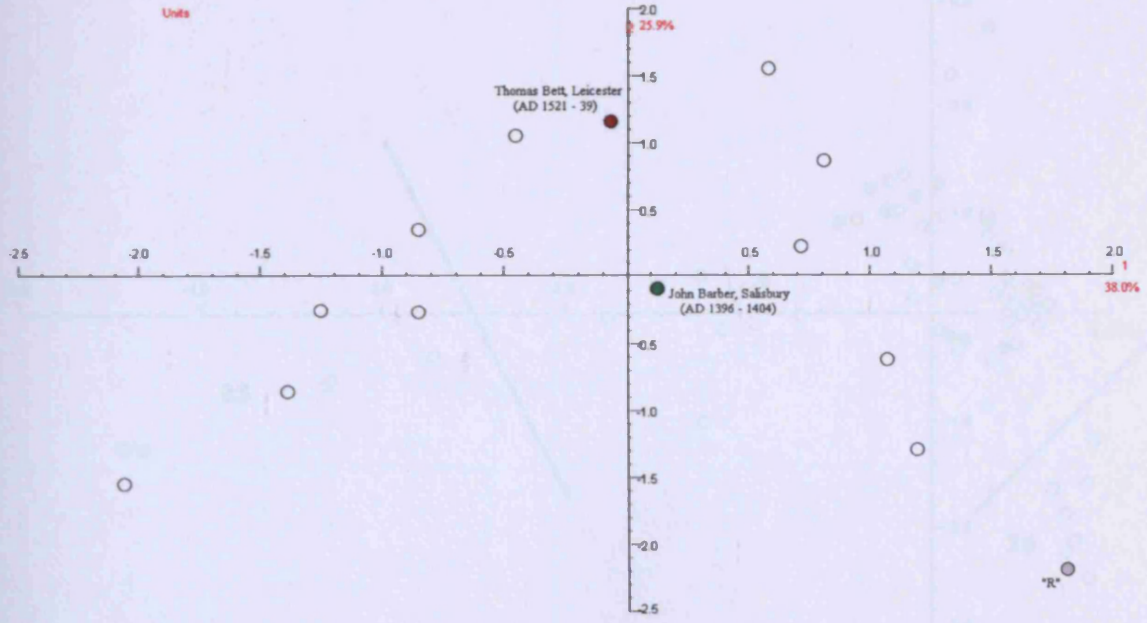


Figure 150: map of bells on the first two axes produced by the correspondence analysis of cluster 24

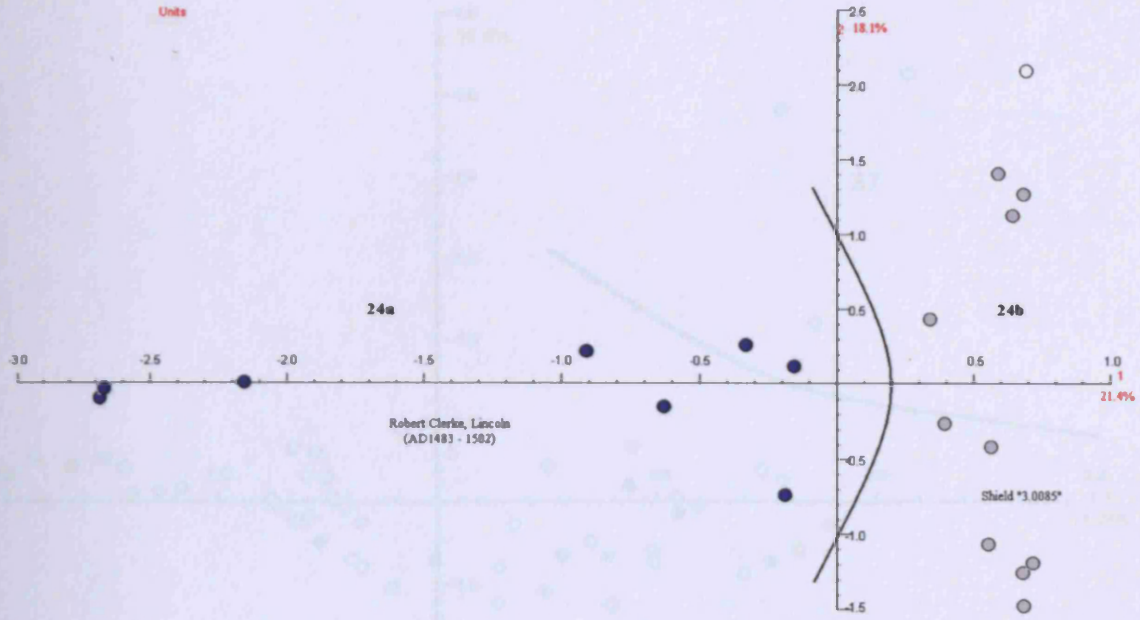


Figure 151: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-24), showing the segregation of clusters 25 and 26

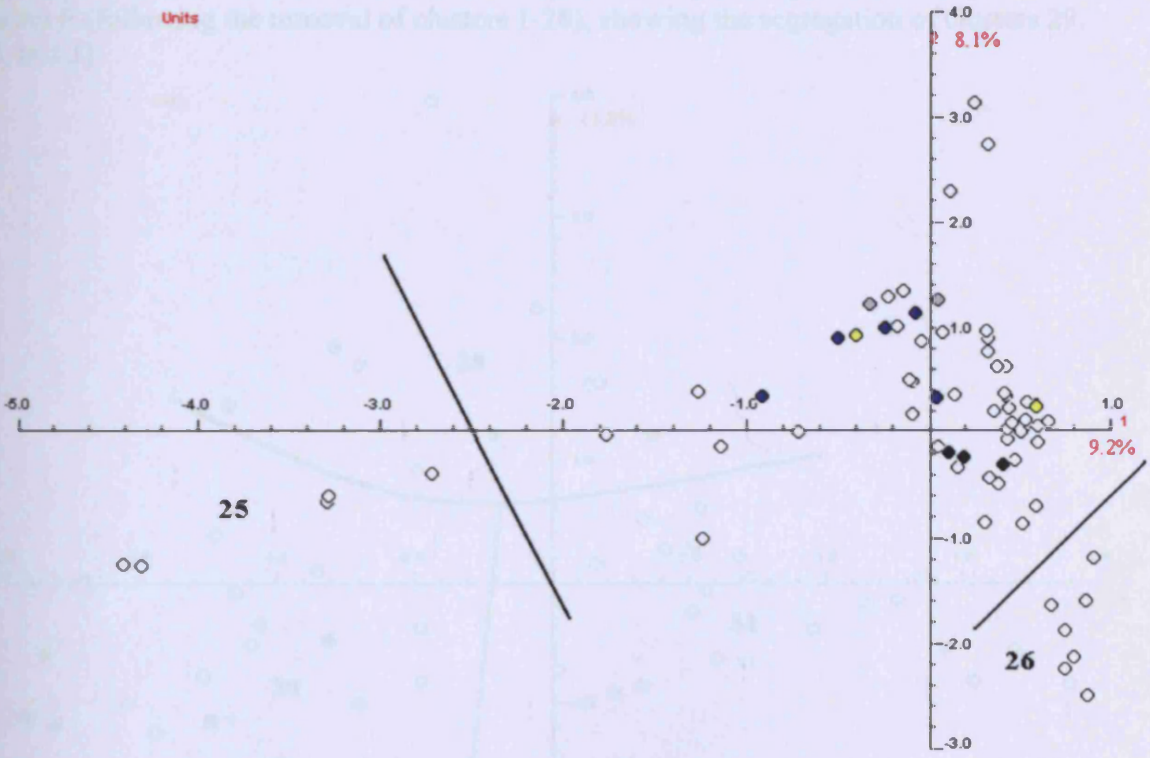


Figure 152: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-26), showing the segregation of clusters 27 and 28

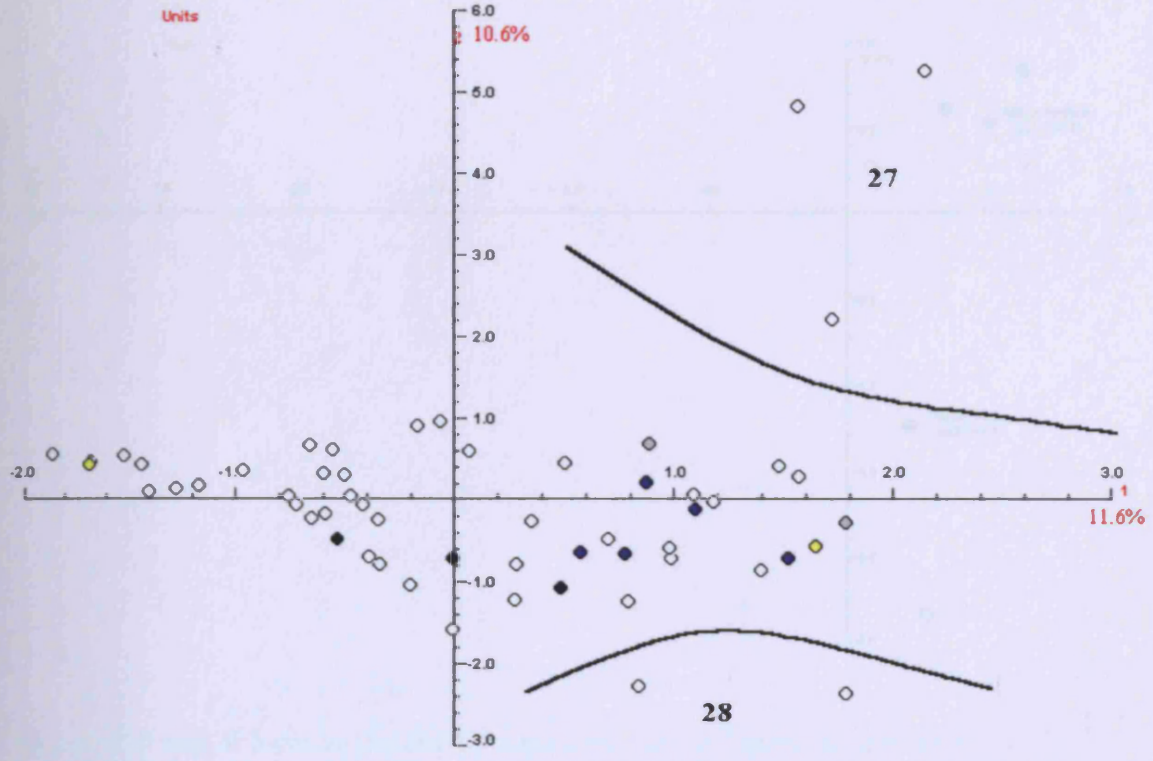


Figure 153: map of bells on the first two axes produced by correspondence analysis of cluster E (following the removal of clusters 1-28), showing the segregation of clusters 29, 30, and 31

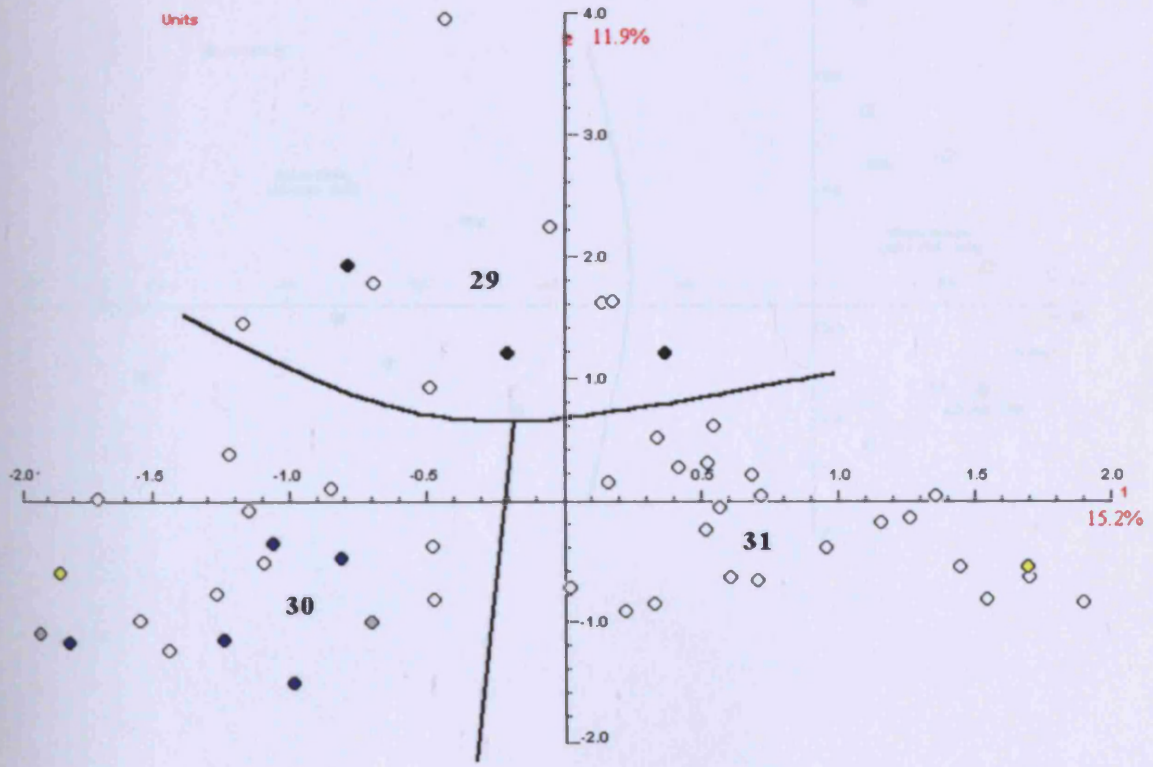


Figure 154: map of bells on the first two axes produced by the correspondence analysis of cluster 29

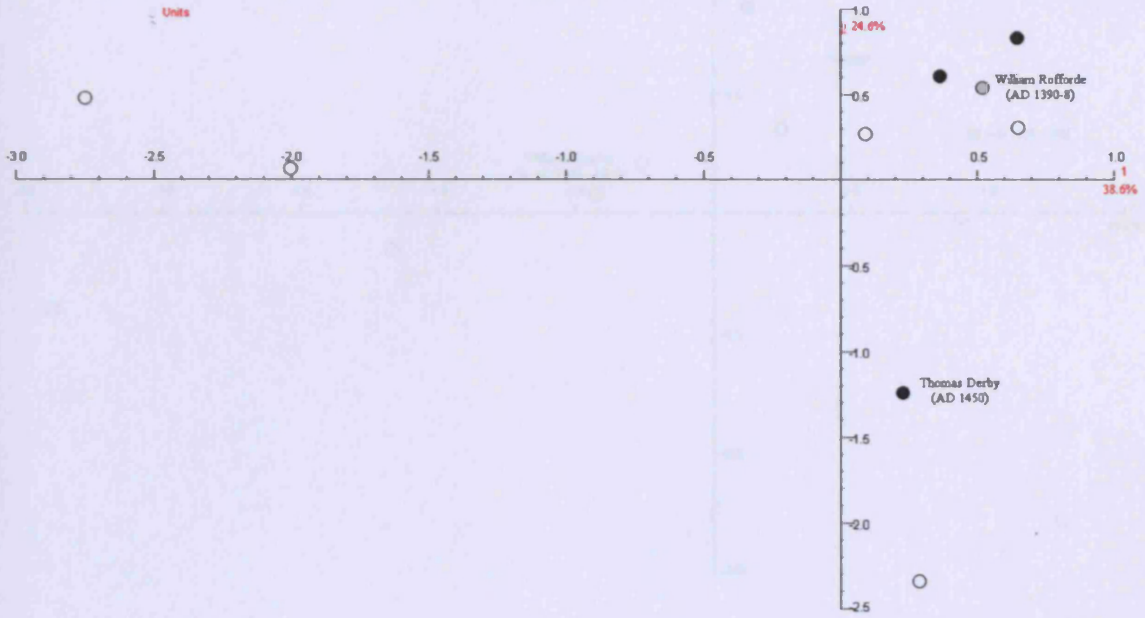


Figure 155: map of bells on the first two axes produced by the correspondence analysis of cluster 30, showing the separation of clusters 30a and 30b

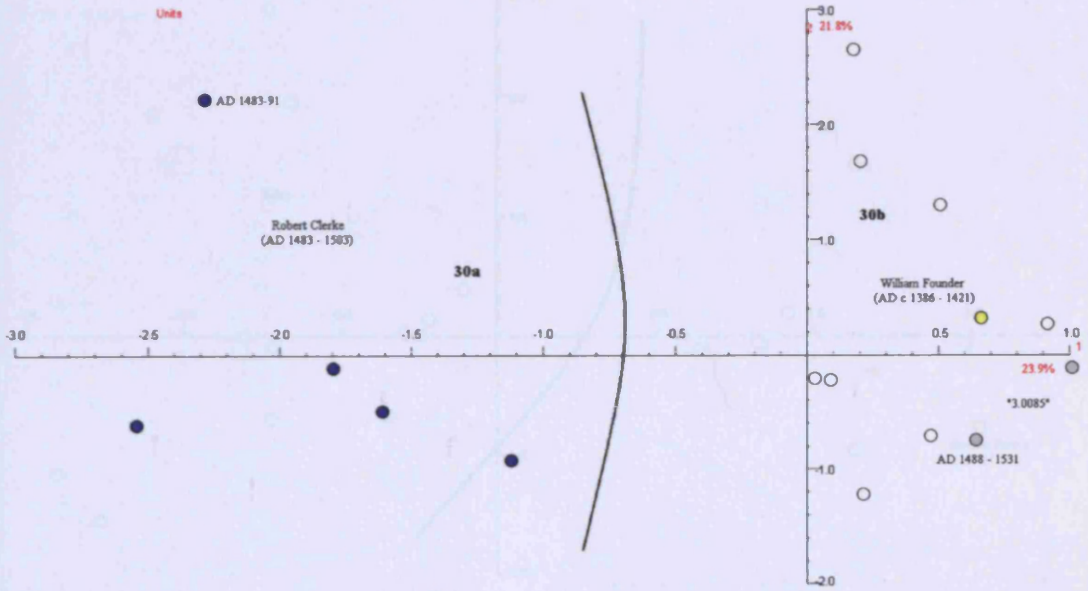


Figure 156: map of bells on the first two axes produced by the correspondence analysis of cluster 30b

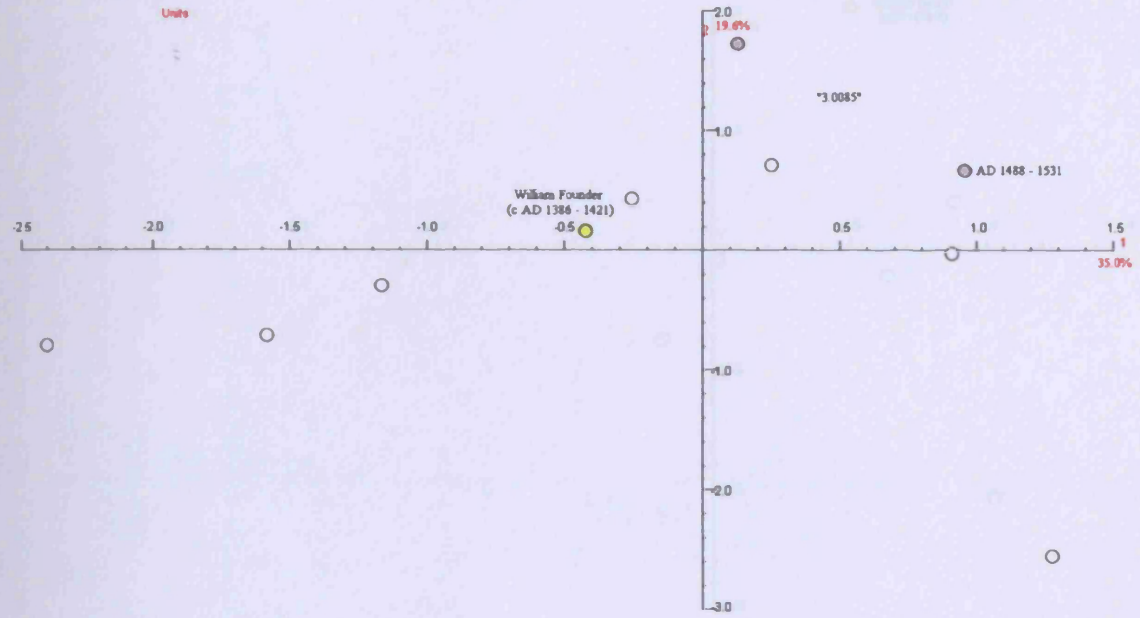


Figure 157: map of bells on the first two axes produced by the correspondence analysis of cluster 31, showing the separation of clusters 31a and 31b

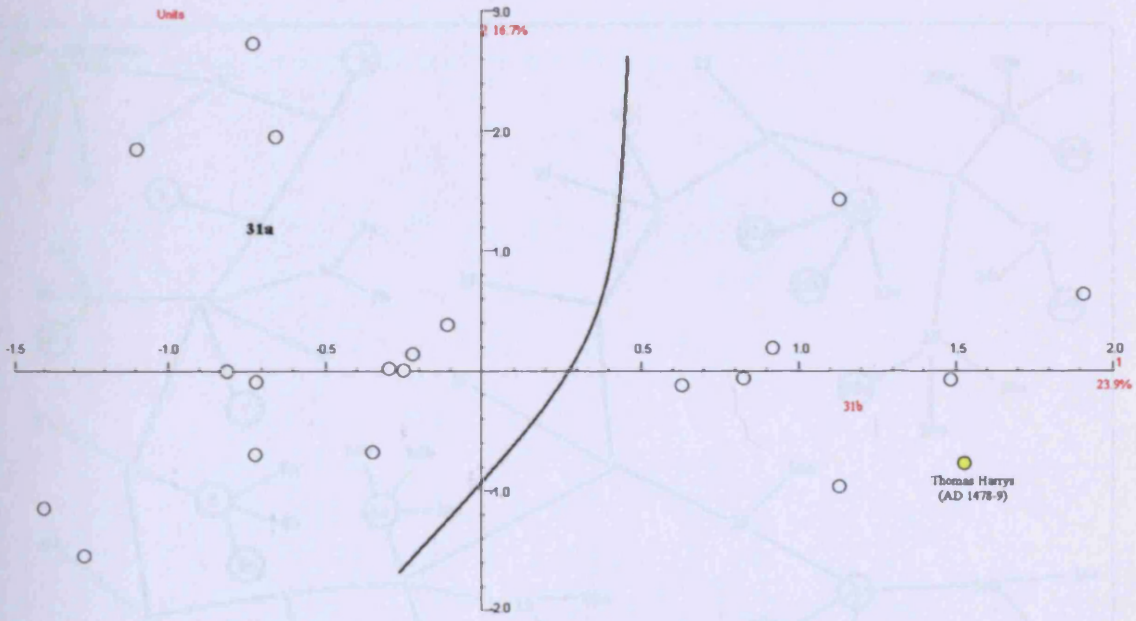


Figure 158: map of bells on the first two axes produced by the correspondence analysis of cluster 31b

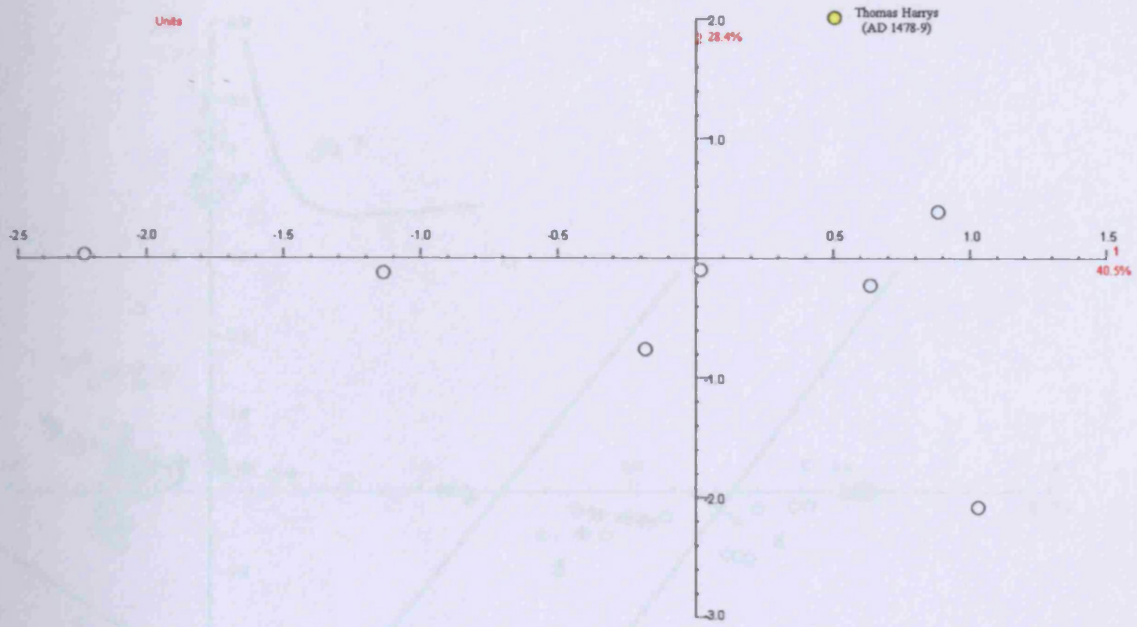


Figure 159: summary of clusters of stamps formed by 'peeling' of the data during successive correspondence analyses; groups which are not further divided have single nodes, analyses showing the 'horseshoe' effect are circled

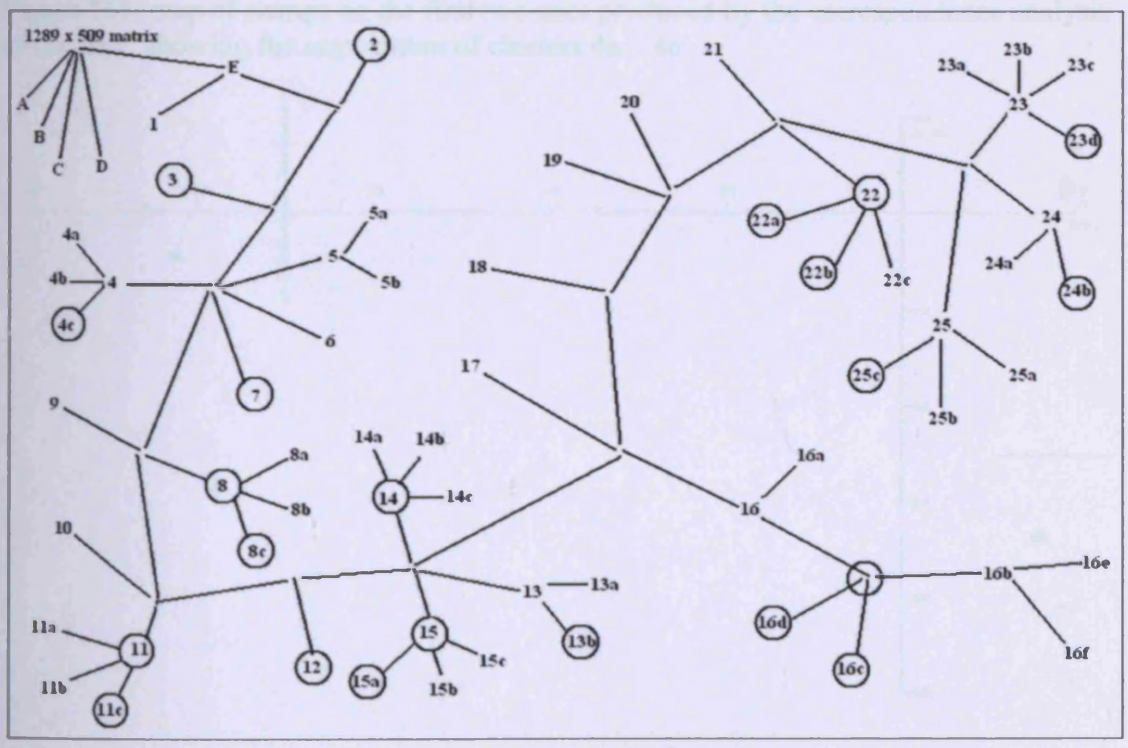


Figure 160: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-3 have been removed), showing the separation of clusters 4 – 7

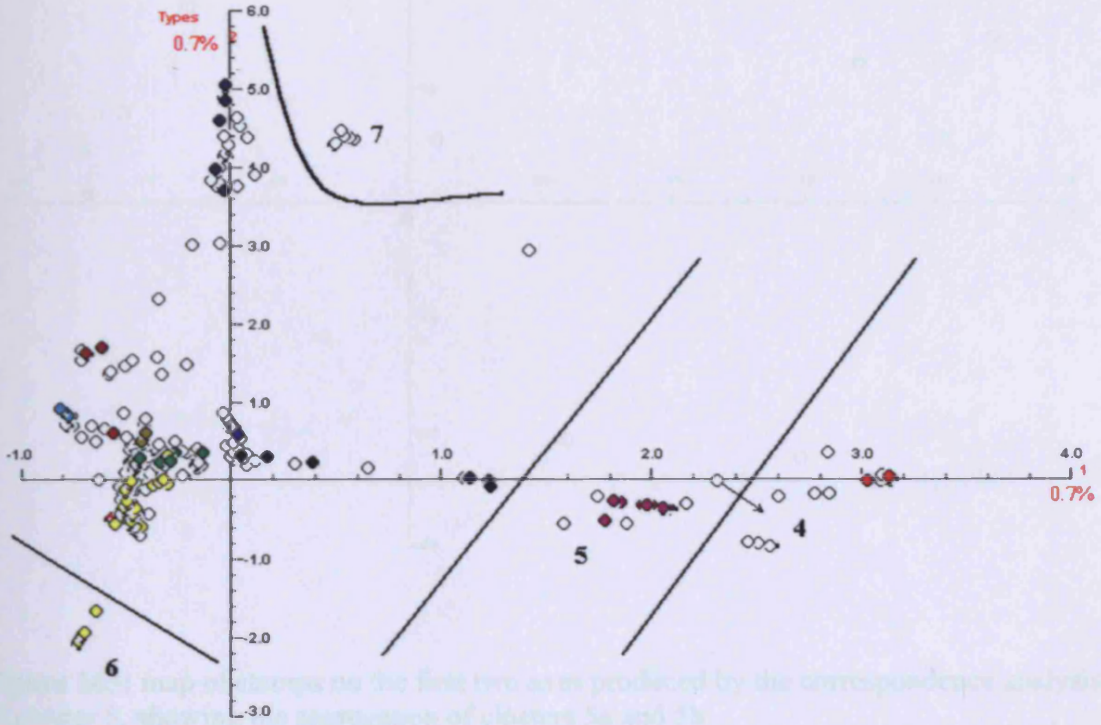


Figure 161: map of stamps on the first two axes produced by the correspondence analysis of cluster 4, showing the segregation of clusters 4a – 4c

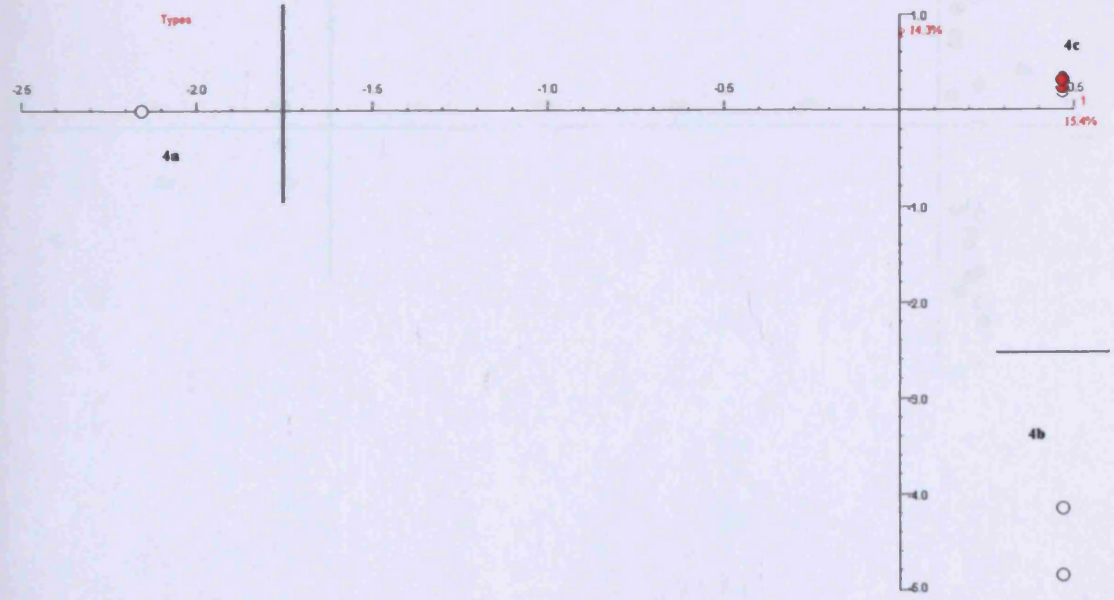


Figure 162: map of stamps on the first two axes produced by the correspondence analysis of cluster 4c

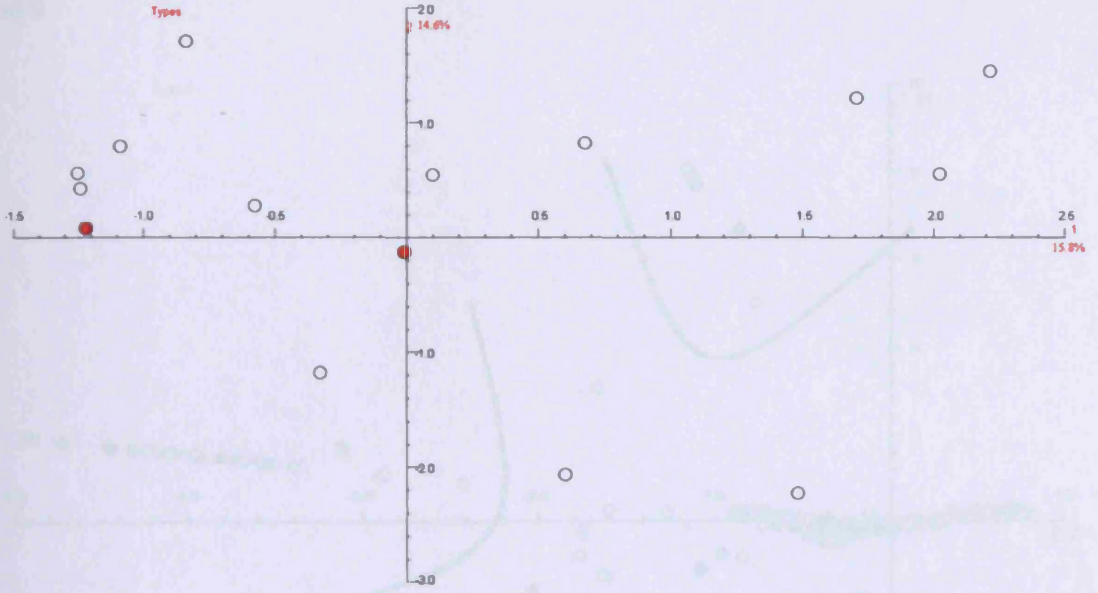


Figure 163: map of stamps on the first two axes produced by the correspondence analysis of cluster 5, showing the segregation of clusters 5a and 5b

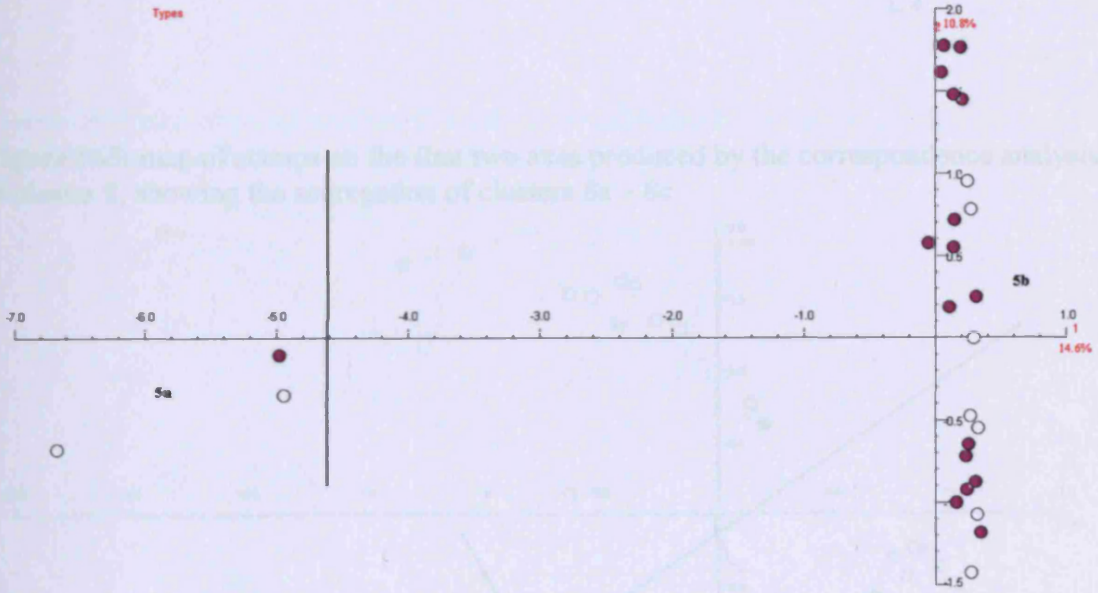


Figure 164: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-7 have been removed), showing the separation of clusters 8 and 9

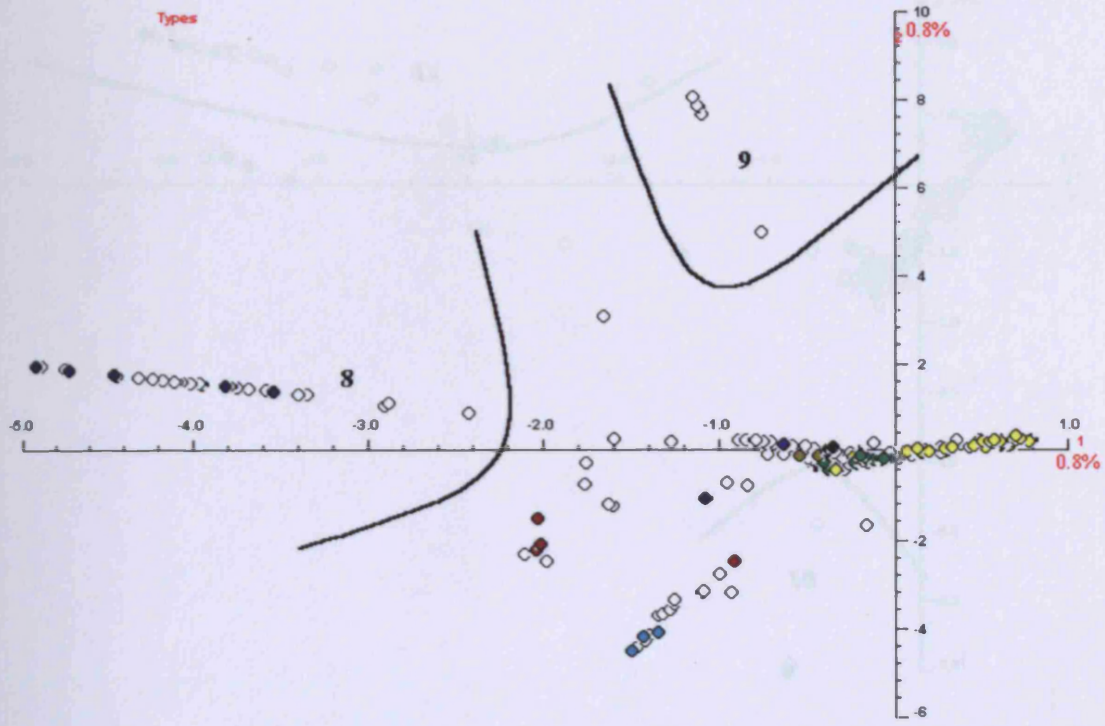


Figure 165: map of stamps on the first two axes produced by the correspondence analysis of cluster 8, showing the segregation of clusters 8a – 8c

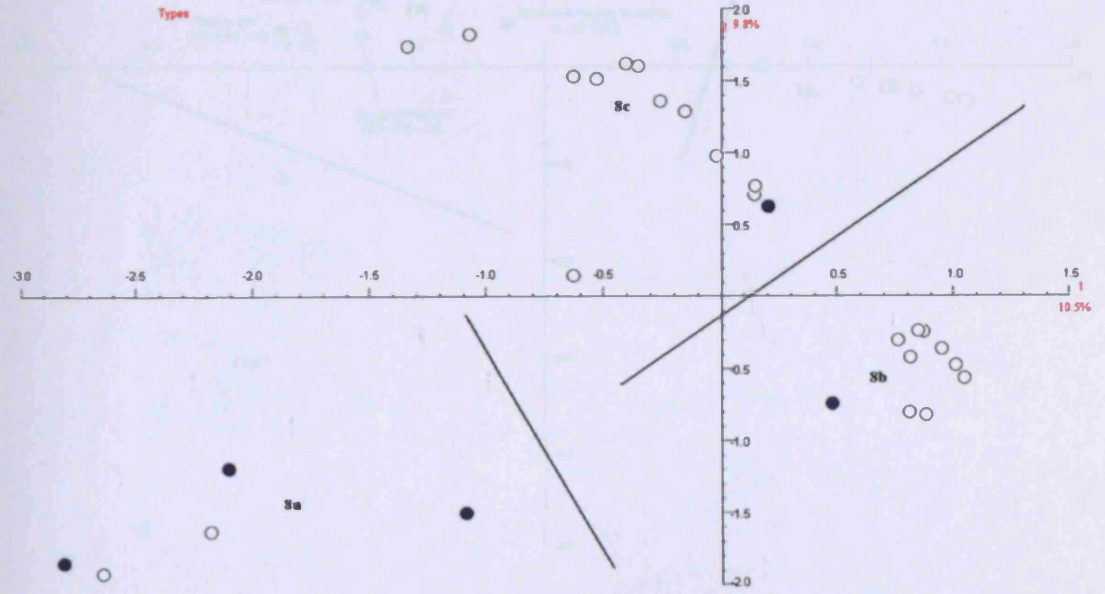


Figure 166: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-9 have been removed), showing the separation of clusters 10 and 11

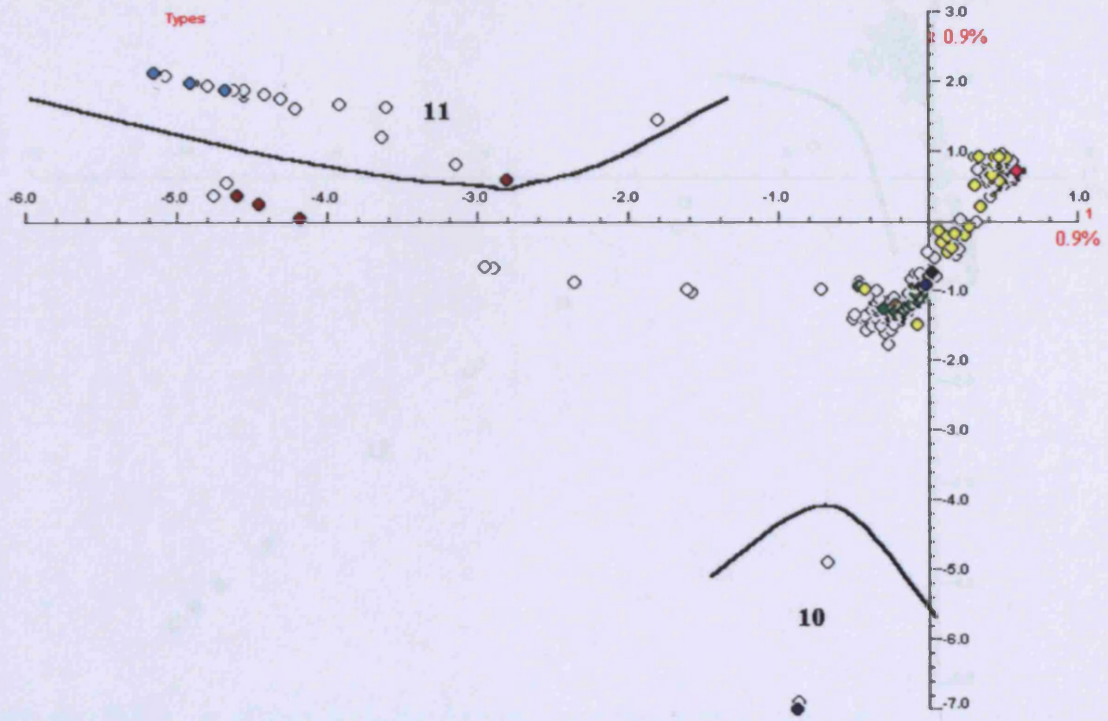


Figure 167: map of stamps on the first two axes produced by the correspondence analysis of cluster 11, showing the segregation of clusters 11a – 11c

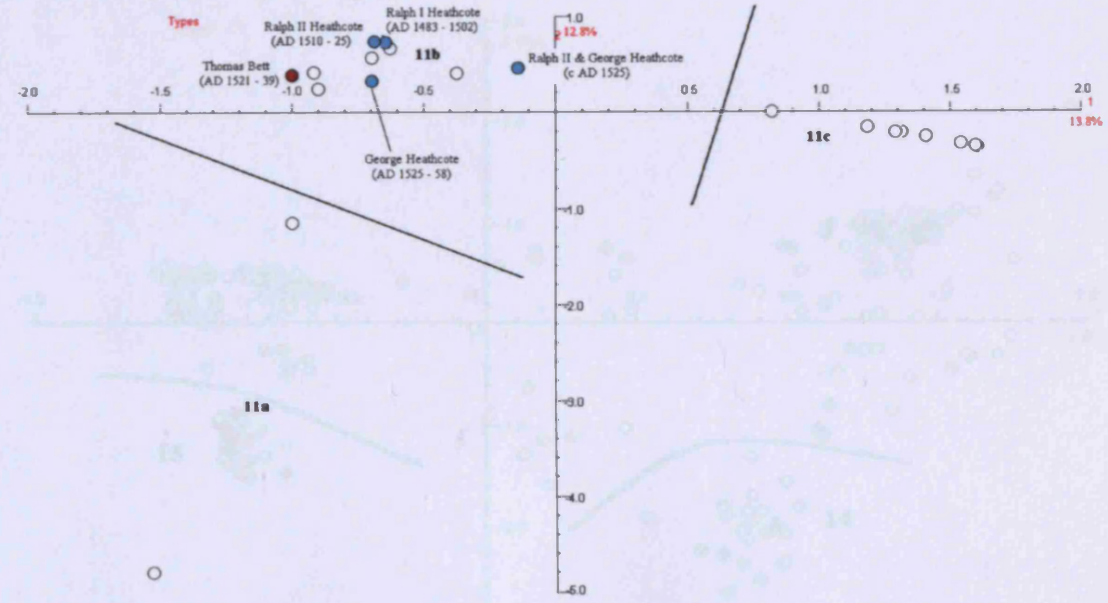


Figure 168: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-11 have been removed), showing the separation of cluster 12

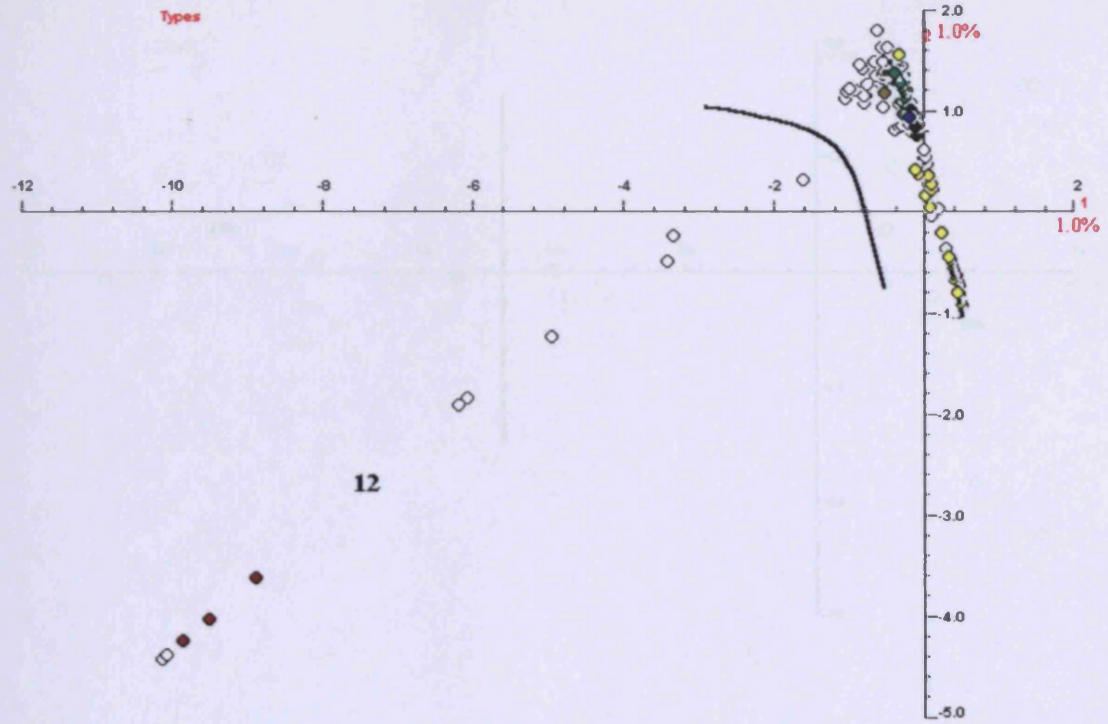


Figure 169: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-12 have been removed), showing the separation of clusters 13 – 15

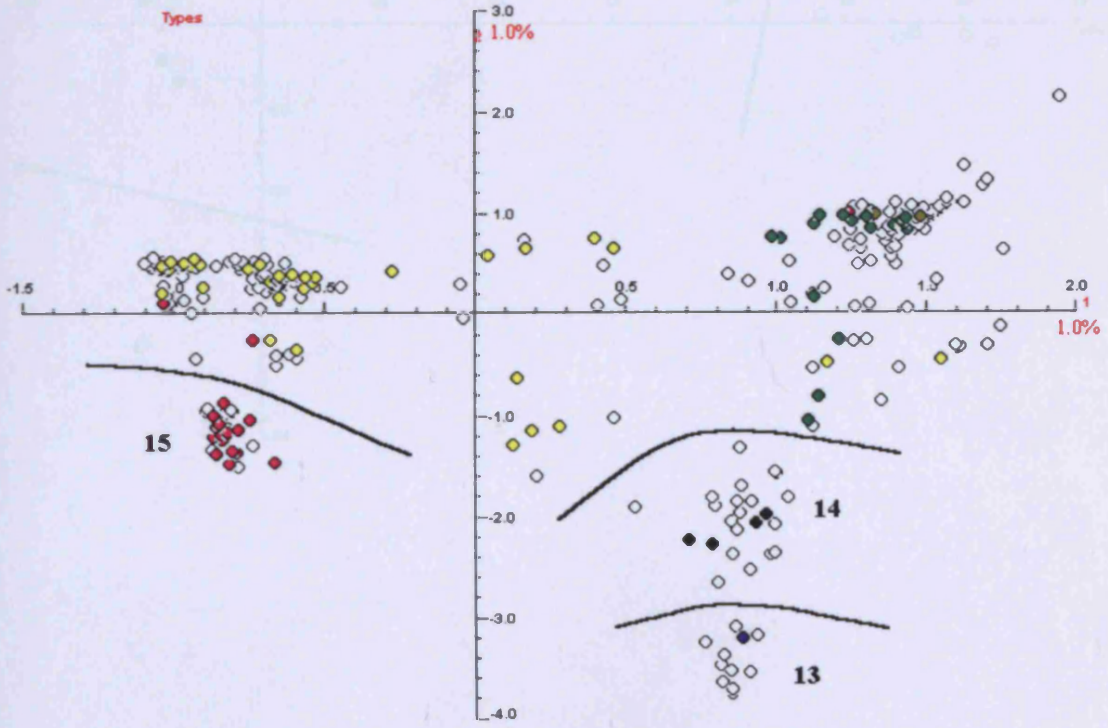


Figure 170: map of stamps on the first two axes produced by the correspondence analysis of cluster 13, showing the segregation of clusters 13a – 13b

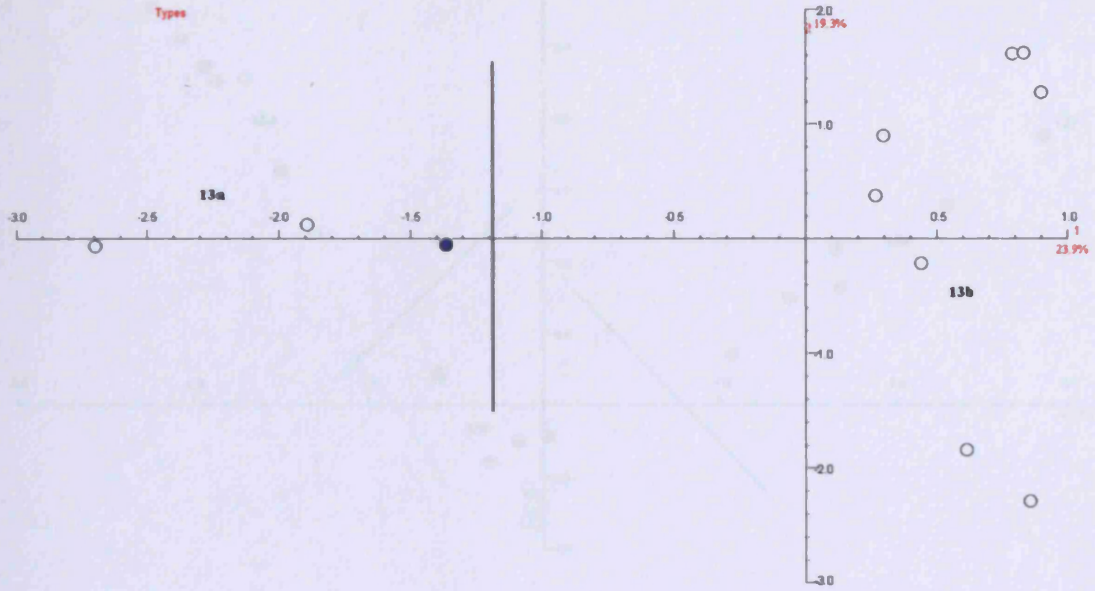


Figure 171: map of stamps on the first two axes produced by the correspondence analysis of cluster 14, showing the segregation of clusters 14a – 14c

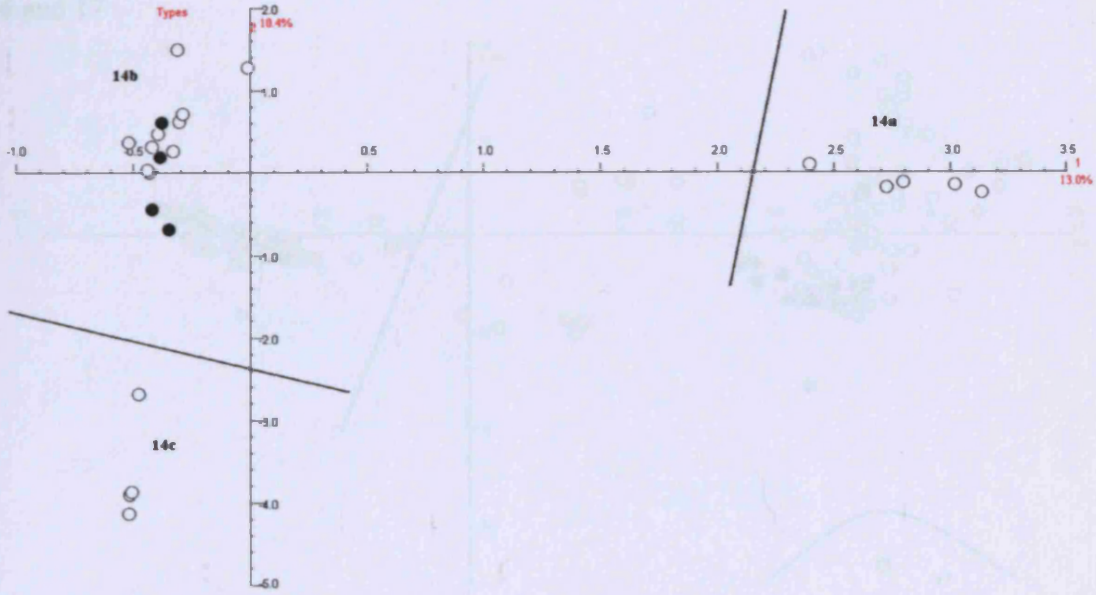


Figure 172: map of stamps on the first two axes produced by the correspondence analysis of cluster 15, showing the segregation of clusters 15a – 15c

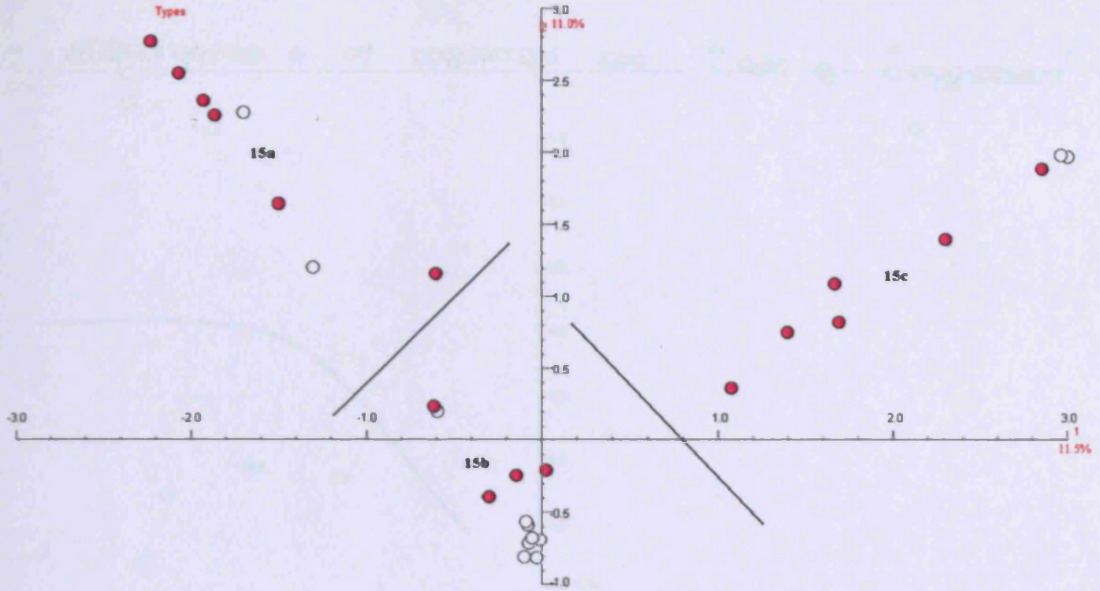


Figure 173: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-15 have been removed), showing the separation of clusters 16 and 17

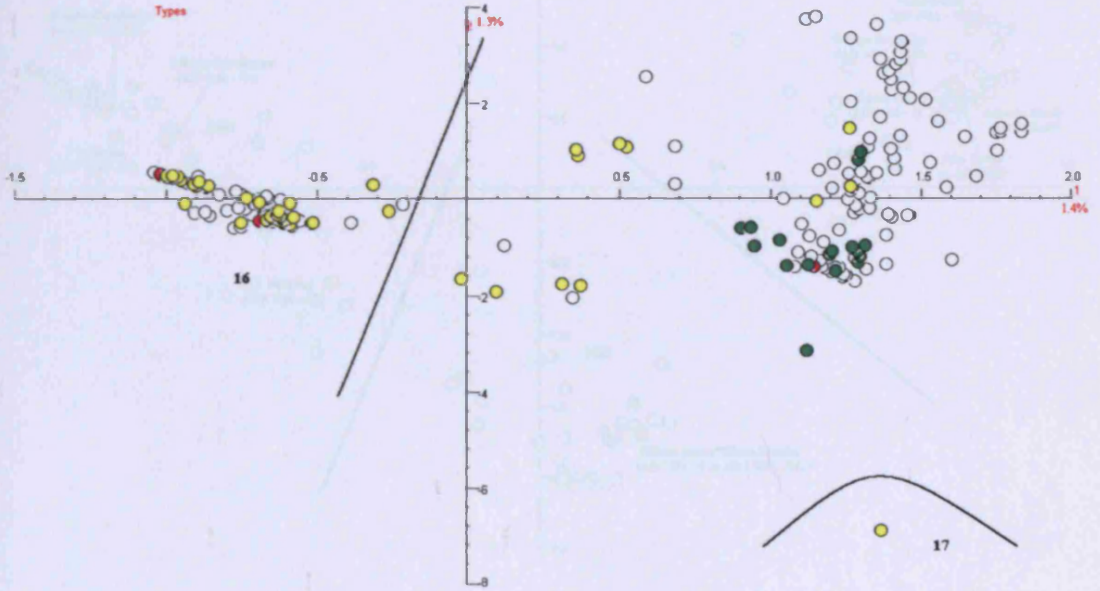


Figure 174: map of stamps on the first two axes produced by the correspondence analysis of cluster 16, showing the segregation of cluster 16a

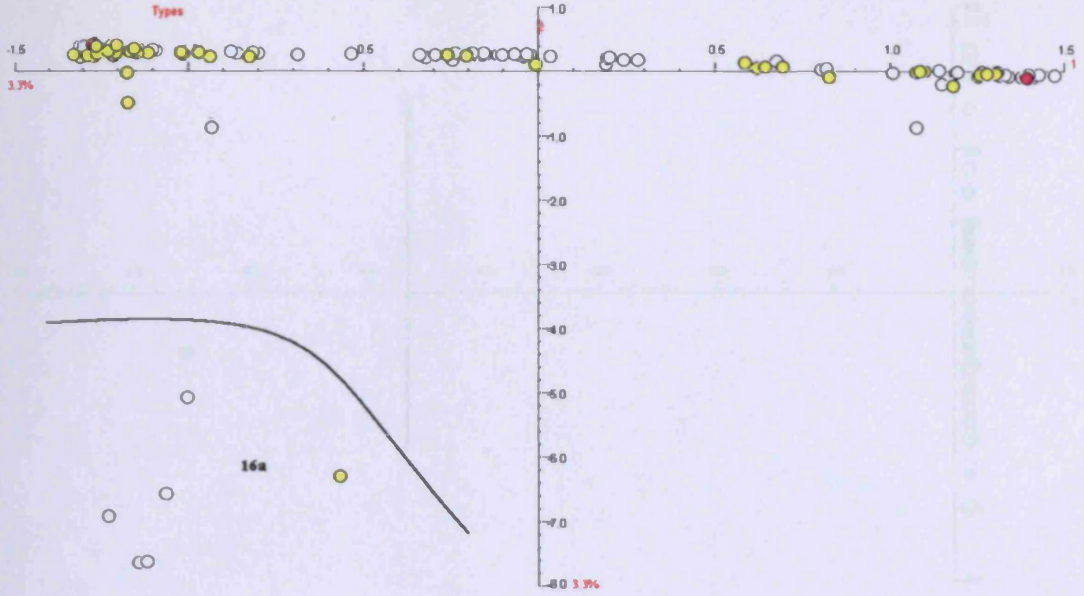


Figure 175: map of stamps on the first two axes produced by the correspondence analysis of cluster 16 (once cluster 16a has been removed), showing the separation of cluster 16b – 16d

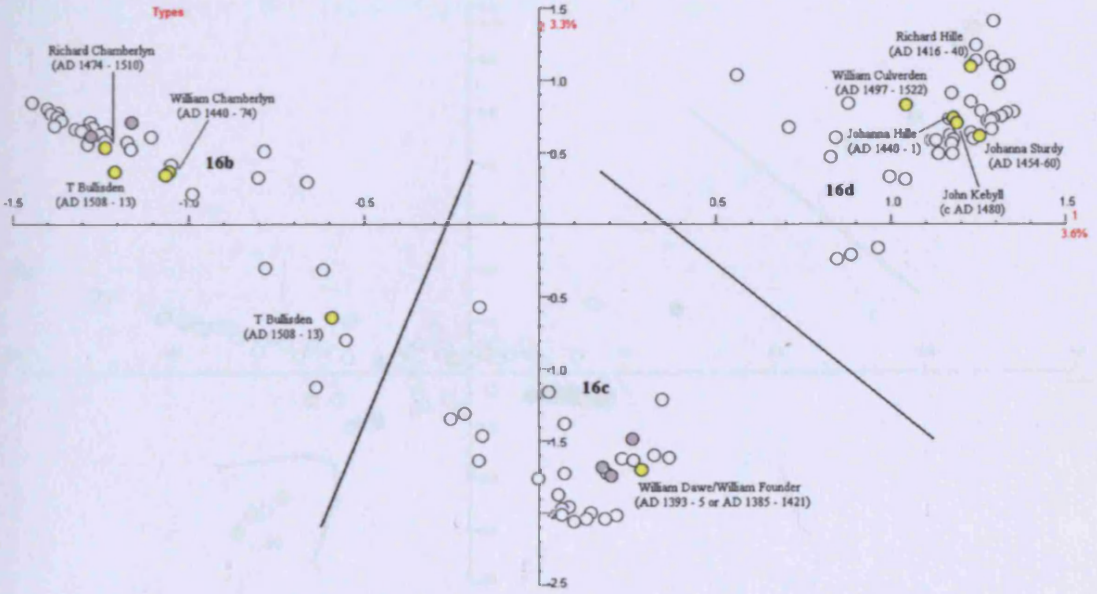


Figure 176: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-17 have been removed), showing the separation of cluster 18

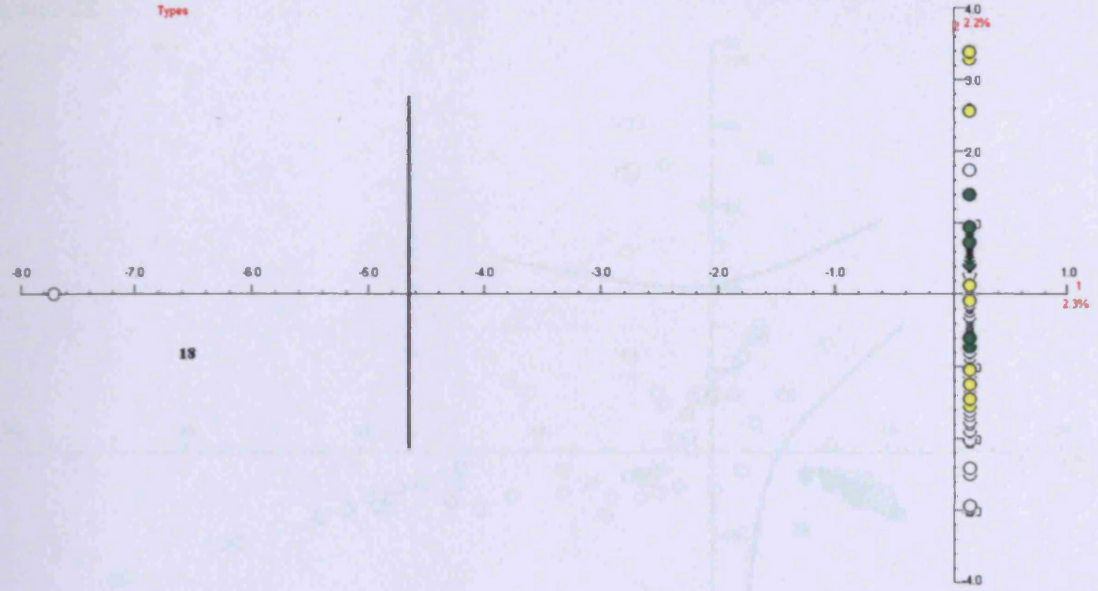


Figure 177: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-18 have been removed), showing the separation of clusters 19 and 20

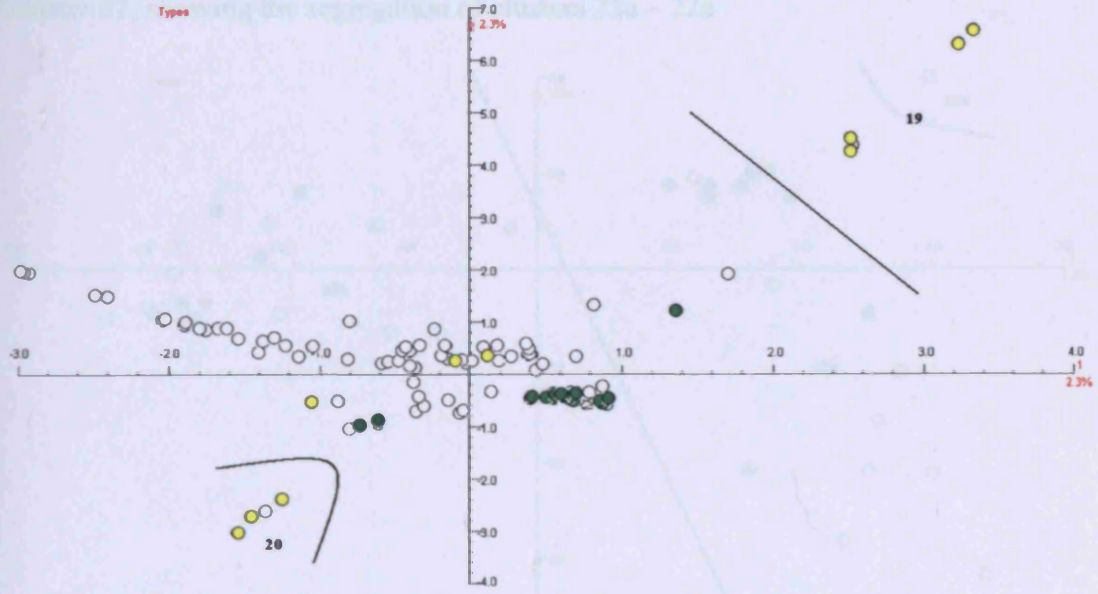


Figure 178: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-20 have been removed), showing the separation of clusters 21 and 22

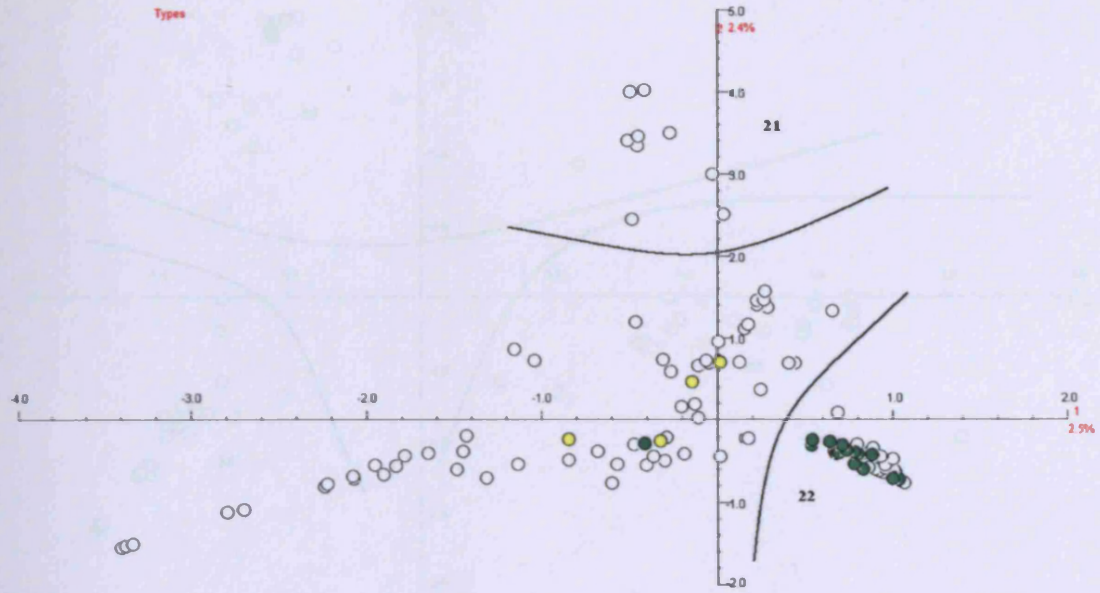


Figure 179: map of stamps on the first two axes produced by the correspondence analysis of cluster 22, showing the segregation of clusters 22a – 22c

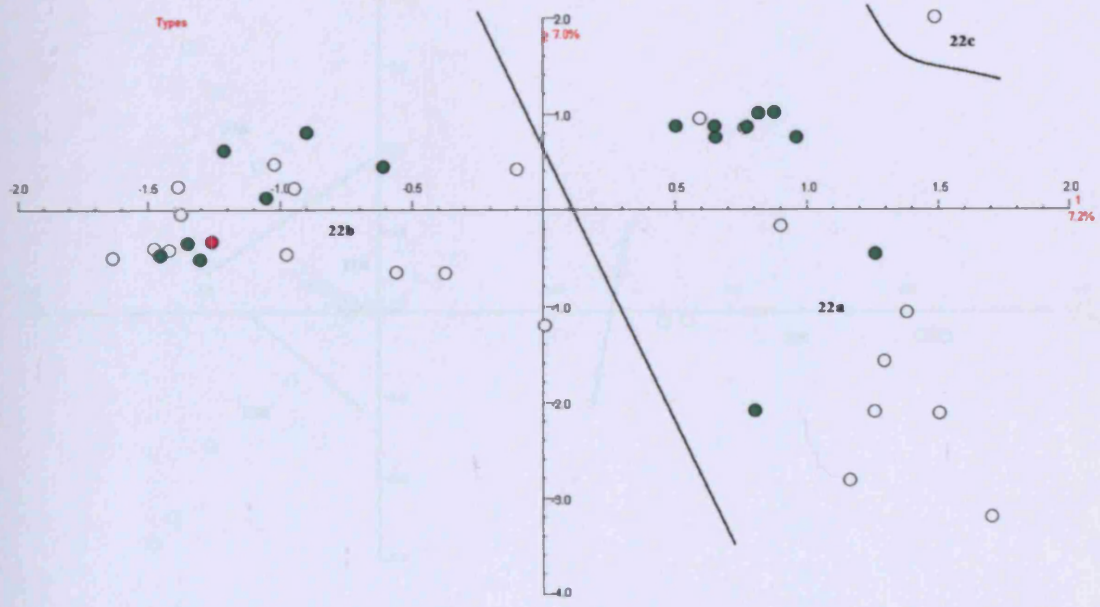


Figure 180: map of stamps on the first two axes produced by the correspondence analysis of cluster E (once clusters 1-22 have been removed), showing the separation of clusters 23 – 25

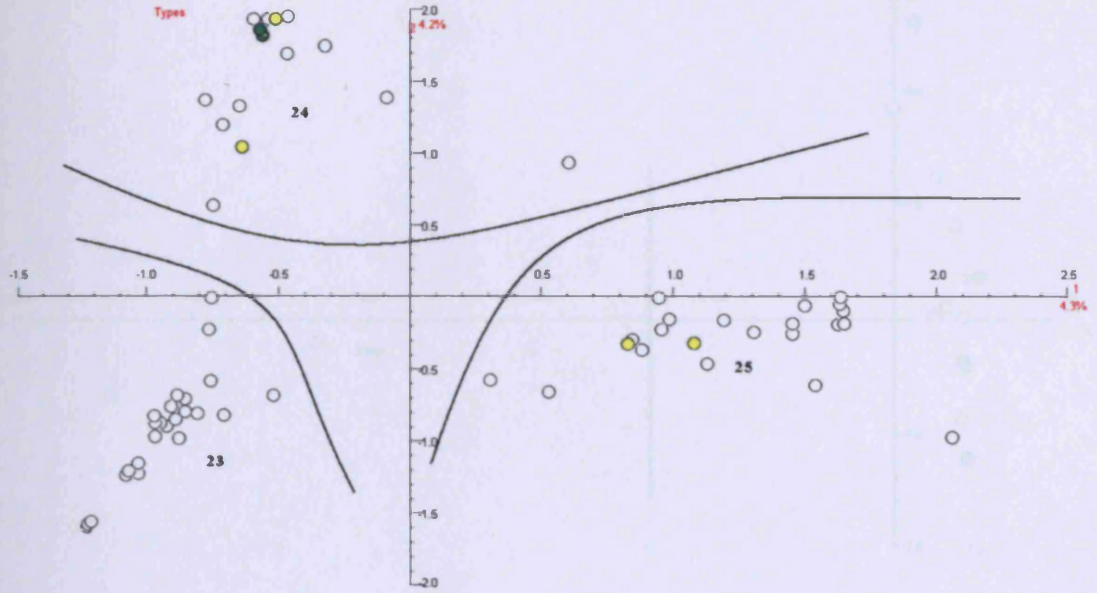


Figure 181: map of stamps on the first two axes produced by the correspondence analysis of cluster 23, showing the segregation of clusters 23a – 23d

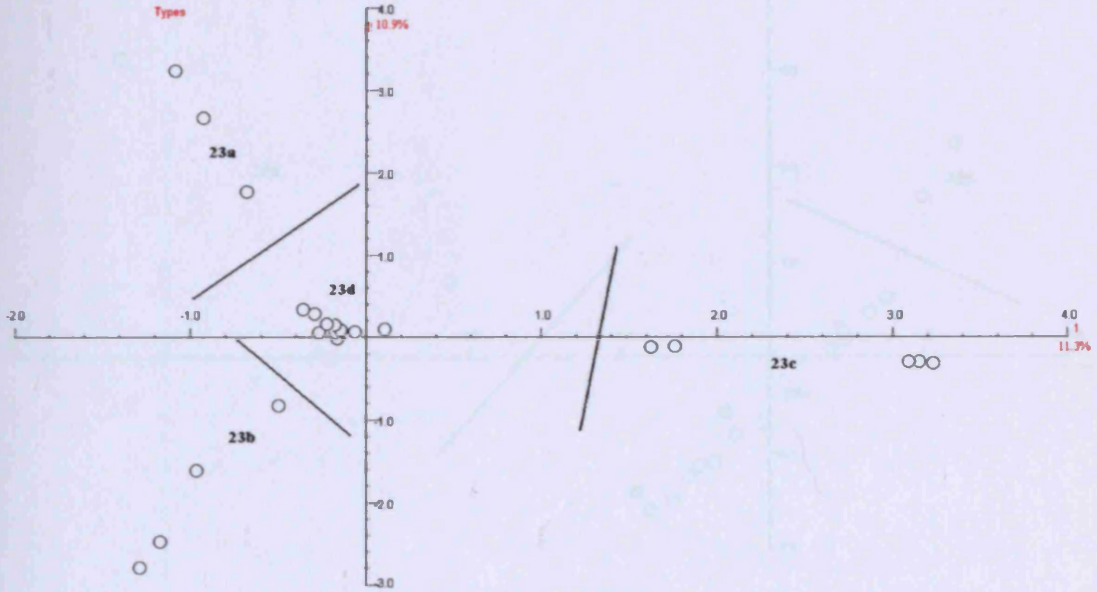


Figure 182: map of stamps on the first two axes produced by the correspondence analysis of cluster 24, showing the segregation of clusters 24a and 24b

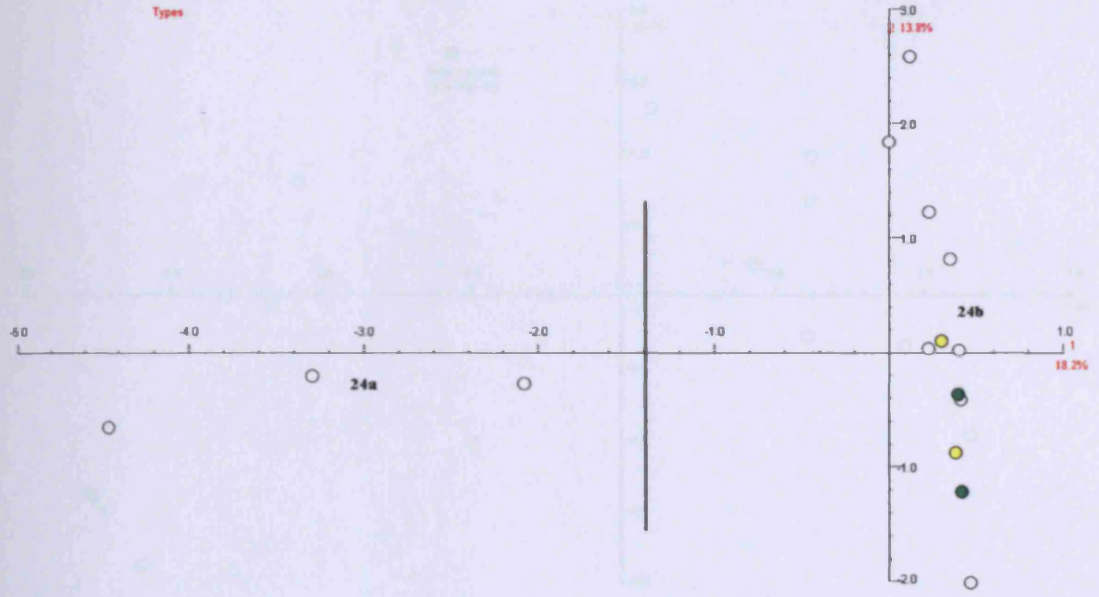


Figure 183: map of stamps on the first two axes produced by the correspondence analysis of cluster 25, showing the segregation of clusters 25a – 25c

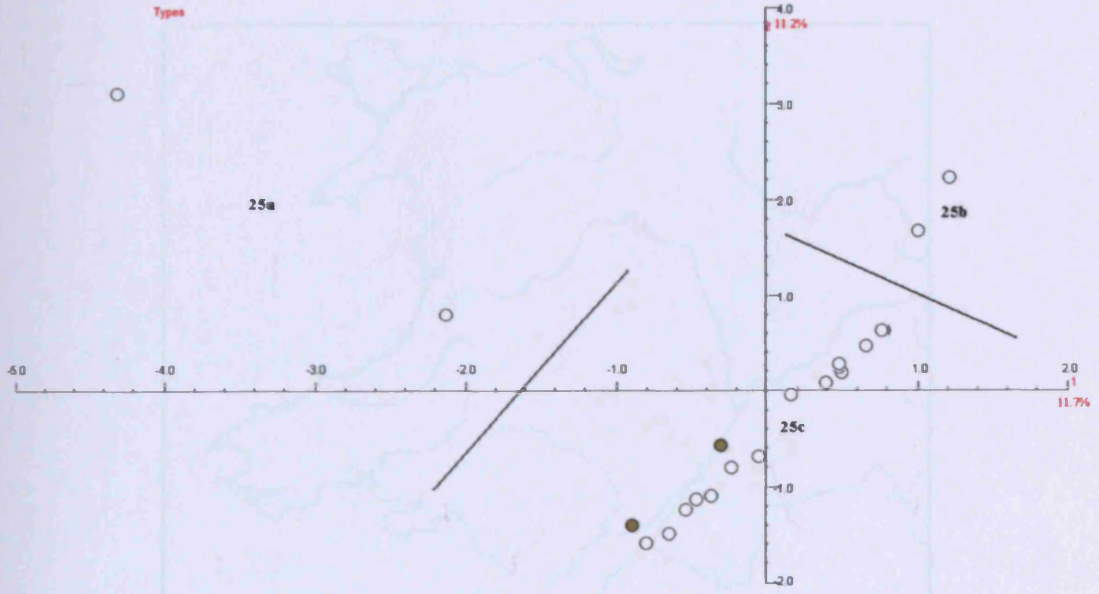


Figure 184: map of stamps on the first two axes of the correspondence analysis of cluster 25c

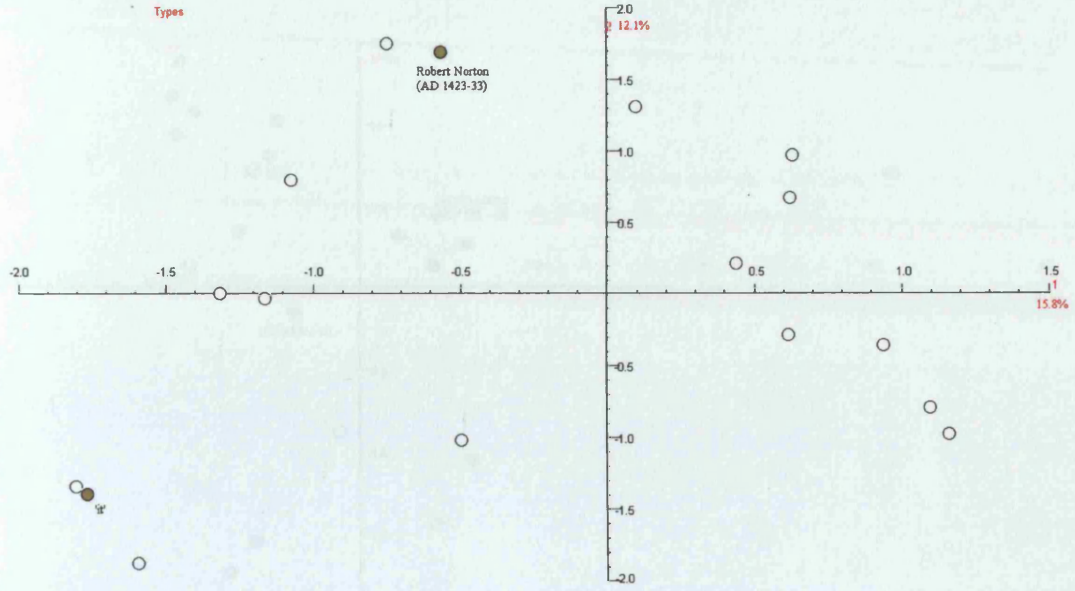


Figure 185: location map of bells included in cluster 17 of the partition of units by correspondence analysis forming 35 clusters

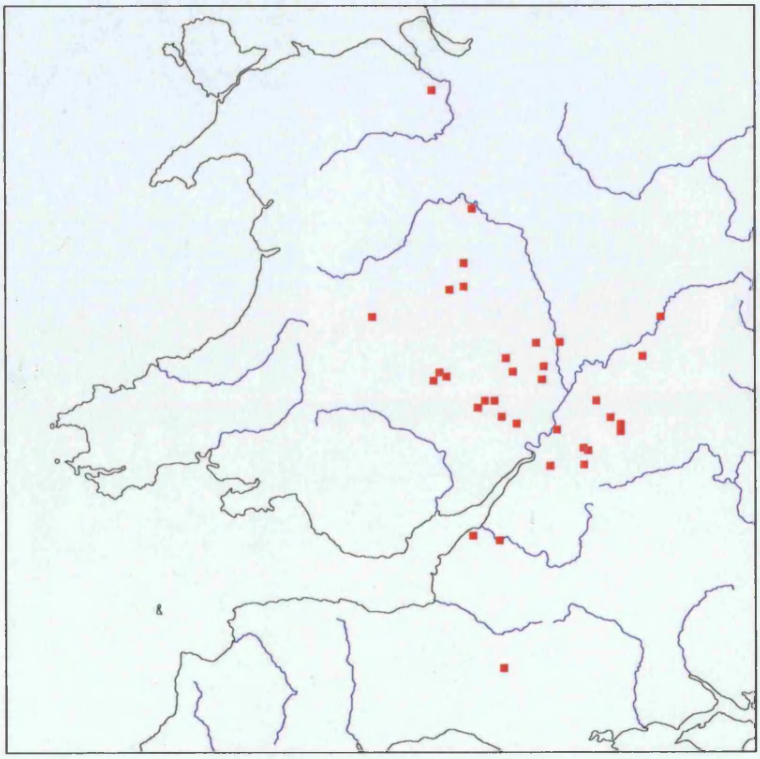


Figure 186: map of bells on the first two axes of the correspondence analysis of cluster 10b

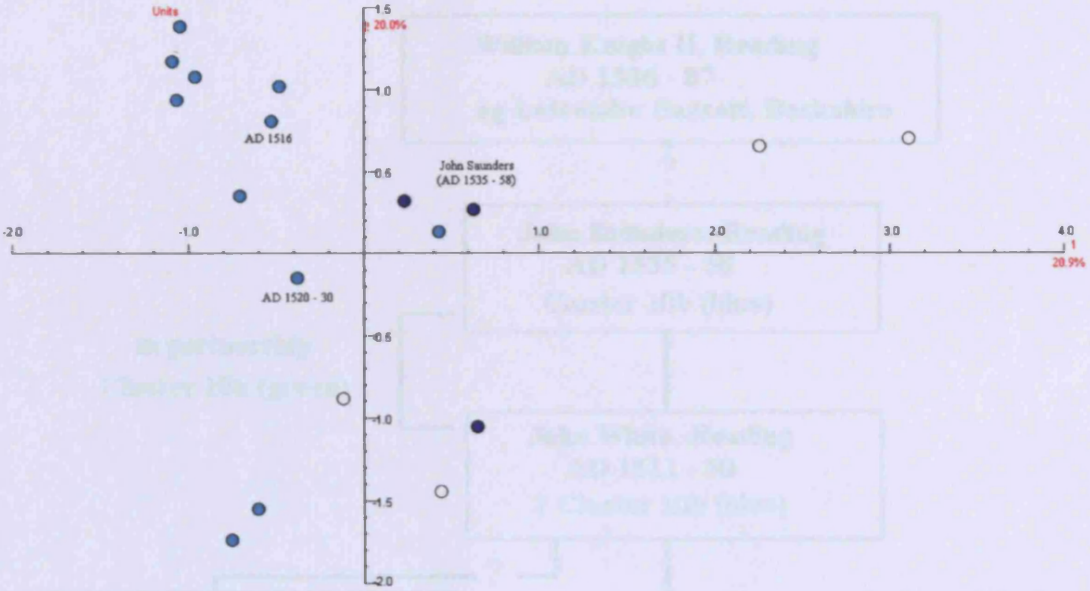


Figure 187: proposed sequence for the Wokingham/Reading foundry, based on the correspondence analysis by units of cluster 10 and documentary evidence

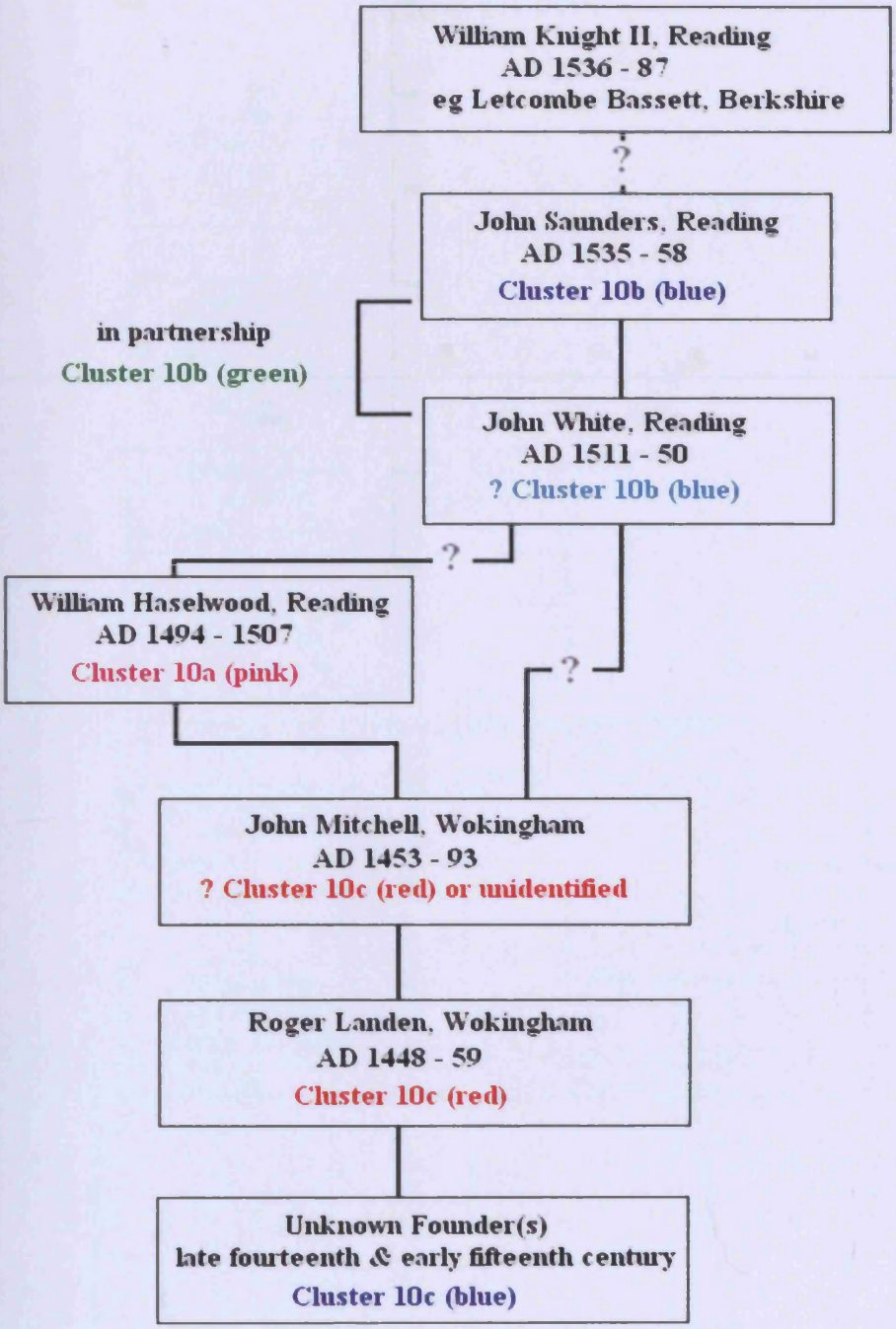


Figure 188: map of stamps on the first two axes of the correspondence analysis of cluster 15b

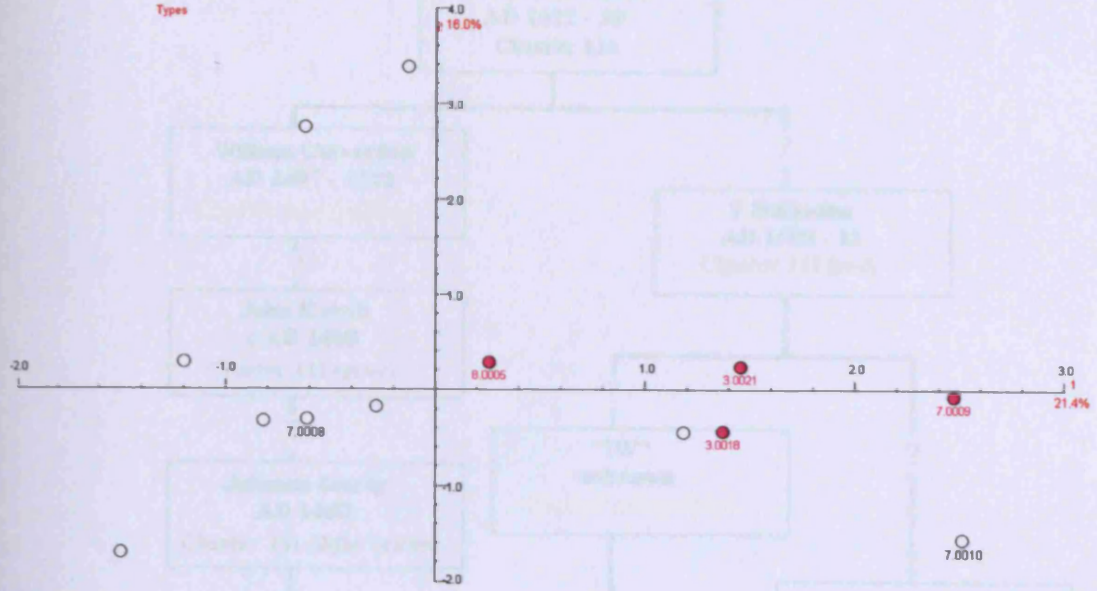


Figure 189: proposed sequence for the London foundries, based on the correspondence analysis by units of cluster 11 and documentary evidence

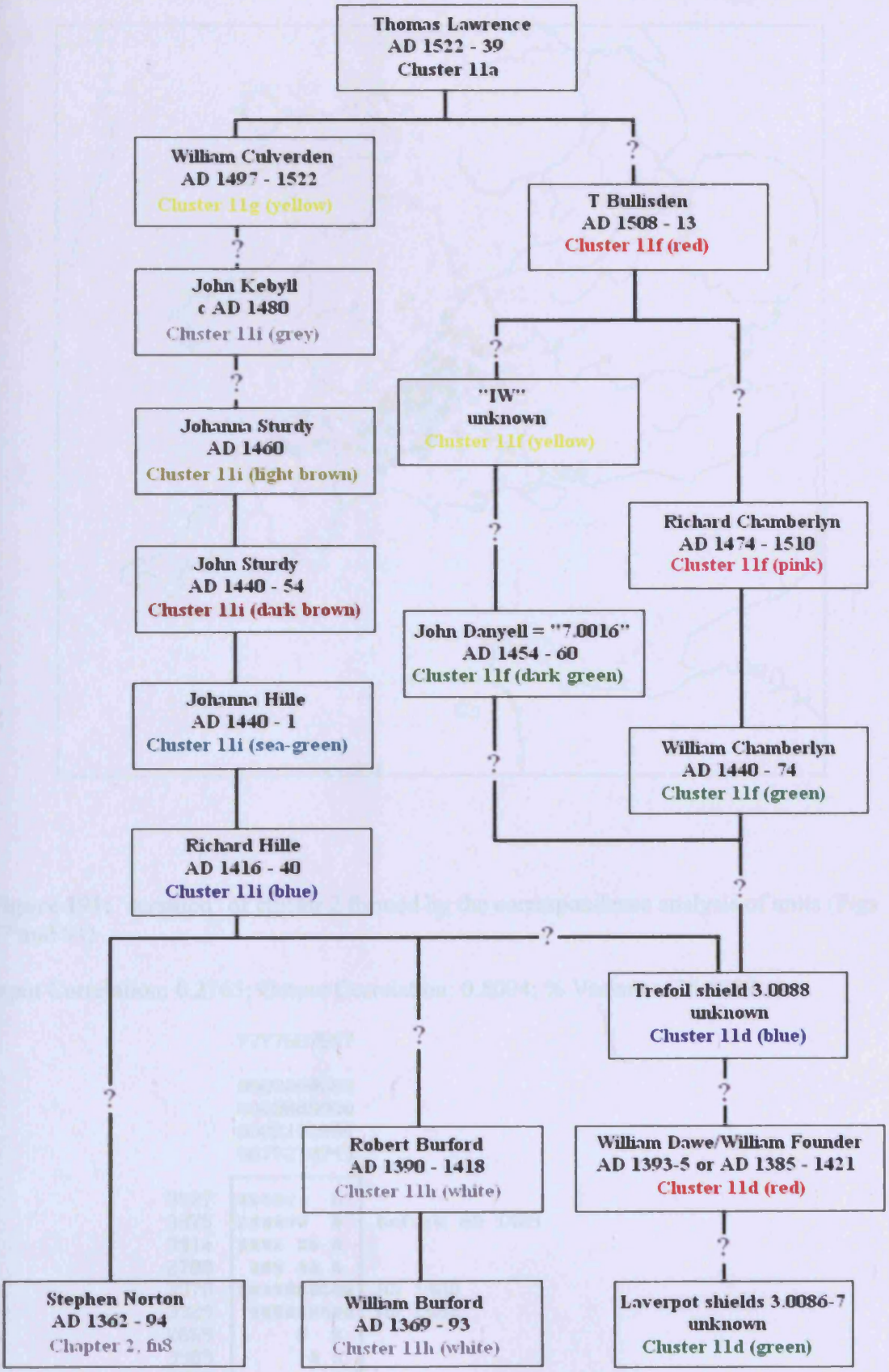


Figure 190: location map of bells included in clusters 19b (red), 19d (green), and 19e (black, hollow) of the partition of units by correspondence analysis forming 35 clusters

Figure 191: 'seriation' of cluster 2 formed by the correspondence analysis of units (Figs 87 and 91)

Input Correlation: 0.2763; Output Correlation: 0.5004; % Variance: 36.6689

```
          7777687517
          ..........
          0000000000
          0000000000
          0002172064
          5677278749

3927      #####   #
3975      ######  #   before AD 1489
3916      #### ## #
2700       ### ## #
3978      ##########  AD 1480
3929       #########  AD 1482
2659         #  #
3909          # #
3955           ##
```

Figure 192: 'seriation' of cluster 3 formed by the correspondence analysis of units (Figs 87 and 93)

Input Correlation: 0.2201; Output Correlation: 0.7655; % Variance: 23.2330

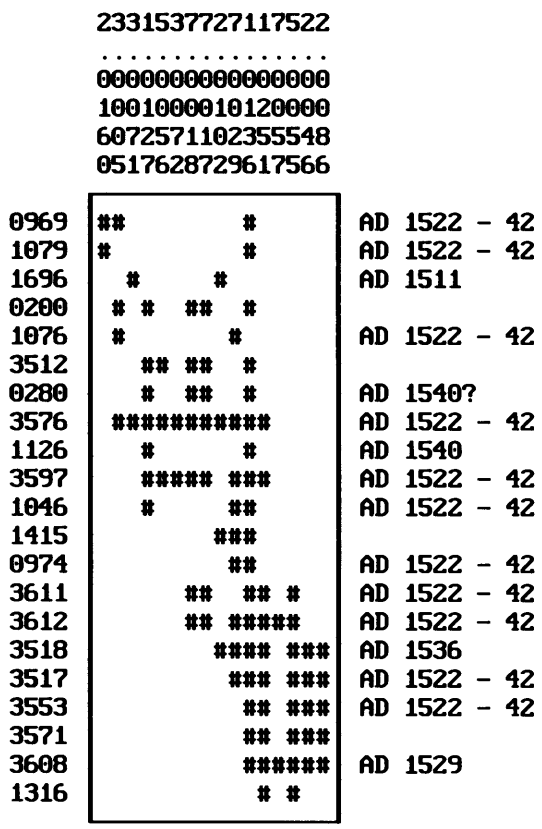
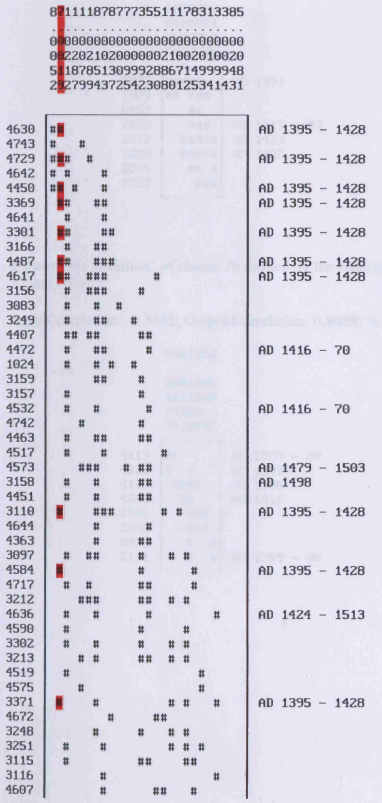
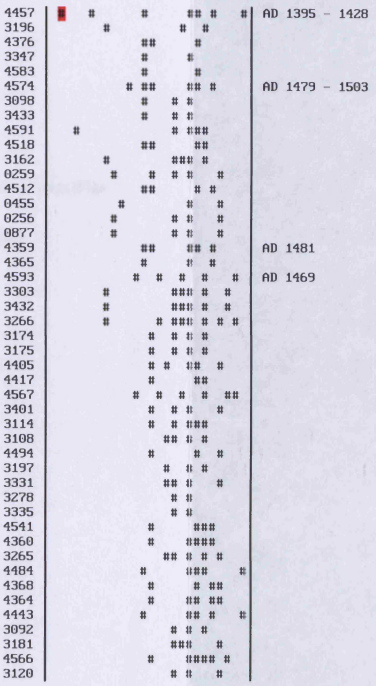


Figure 193: 'seriation' of cluster 6d formed by the correspondence analysis of units (Figs 87 and 104-5)

Input Correlation: 0.2976;
Output Correlation: 0.8000;
% Variance: 11.6342



7.0019 – trademark of Thomas Potter (AD 1395 – 1428)



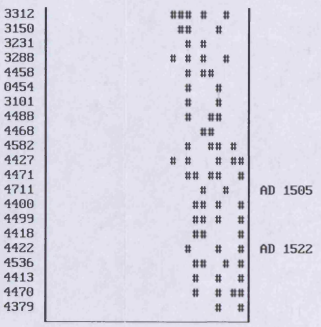


Figure 194: 'seriation' of cluster 7a formed by the correspondence analysis of units (Figs 87 and 108)

Input Correlation: -0.0849; Output Correlation: 0.6050; % Variance: 53.1716

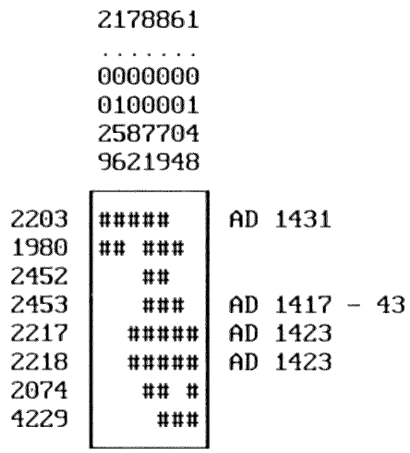


Figure 195: 'seriation' of cluster 7b formed by the correspondence analysis of units (Figs 87 and 109)

Input Correlation: -0.3445; Output Correlation: 0.8059; % Variance: 35.9748

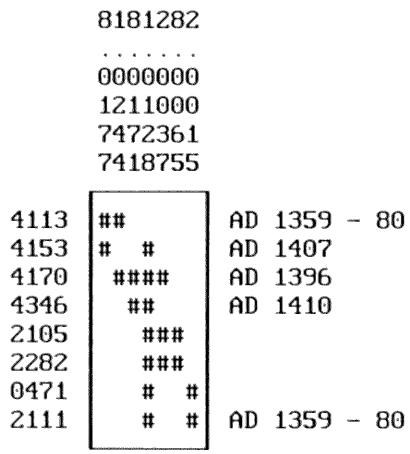


Figure 196: 'seriation' of cluster 9d formed by the correspondence analysis of units (Figs 87 and 118)

Input Correlation: 0.1656; Output Correlation: 0.7746; % Variance: 28.3805

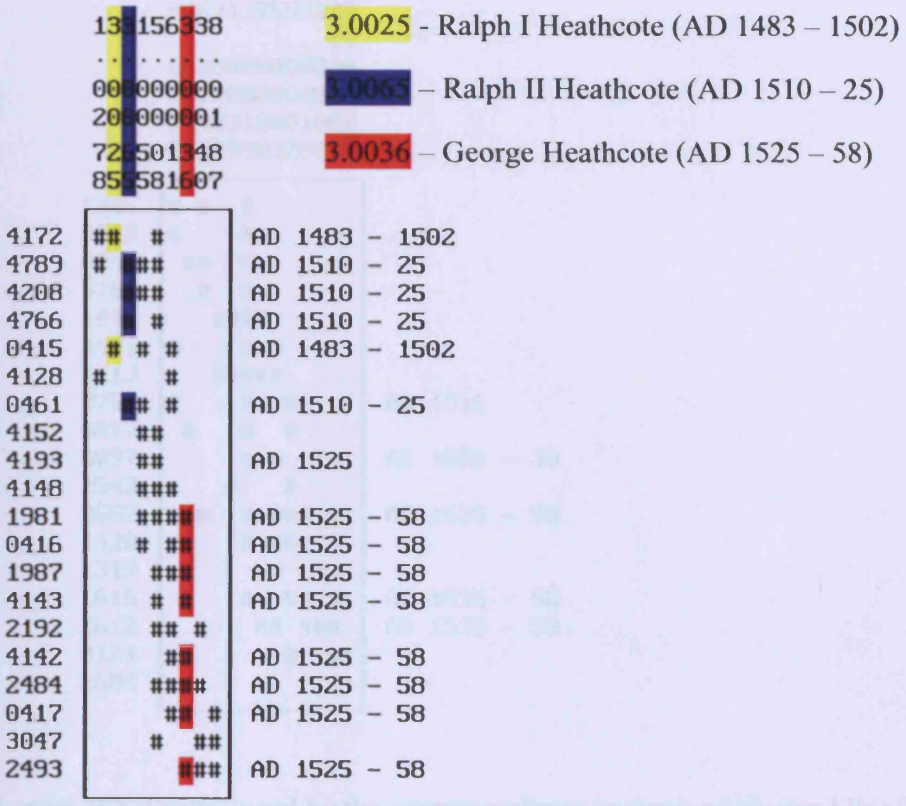


Figure 197: 'seriation' of cluster 10b produced by the correspondence analysis of units (Figs 87 and 186)

Input Correlation: 0.0875; Output Correlation: 0.7919; % Variance: 20.8895

```
                8287137553223
                .............
                0000000000000
                2000000000000
                1040312001002
                2558990328760

1445  # #   #
2313  #     #
0066   ##   #
0764    #   #
1440      ####
1401  #     # #
1413      #####
3751  #     #   #       AD 1516
0077   #    #   #
0097        # #         AD 1520 - 30
2543       #    #
3552    #  # ### #      AD 1535 - 58
1420        # ##  #
1319          #   #
1616        #  ## #      AD 1535 - 58
2612         ## ###     AD 1535 - 58
0121           #  ##
2604              ##
```

Figure 198: map of bells produced by the correspondence analysis of cluster 11b of the partition of units

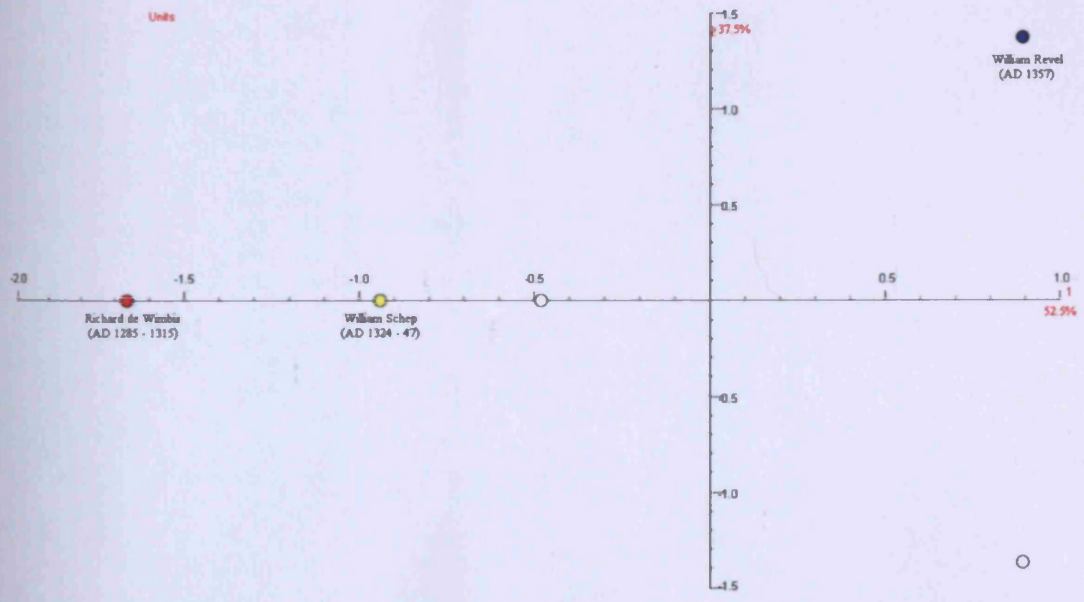


Figure 199: 'seriation' of cluster 11b produced by the correspondence analysis of units (Figs 87 and 198)

Input Correlation: 0.3699; Output Correlation: 0.8367; % Variance: 52.5105

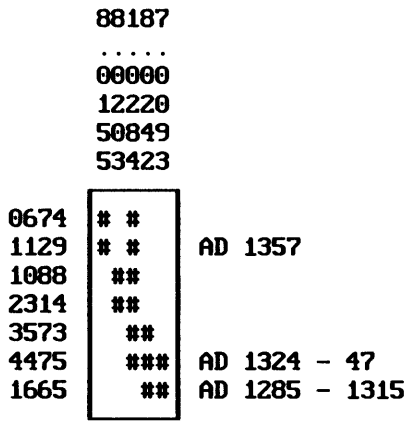


Figure 200: 'seriation' of cluster 11h produced by the correspondence analysis of units (Figs 87 and 128)

Input Correlation: 0.0553; Output Correlation: 0.8226; % Variance: 15.4420

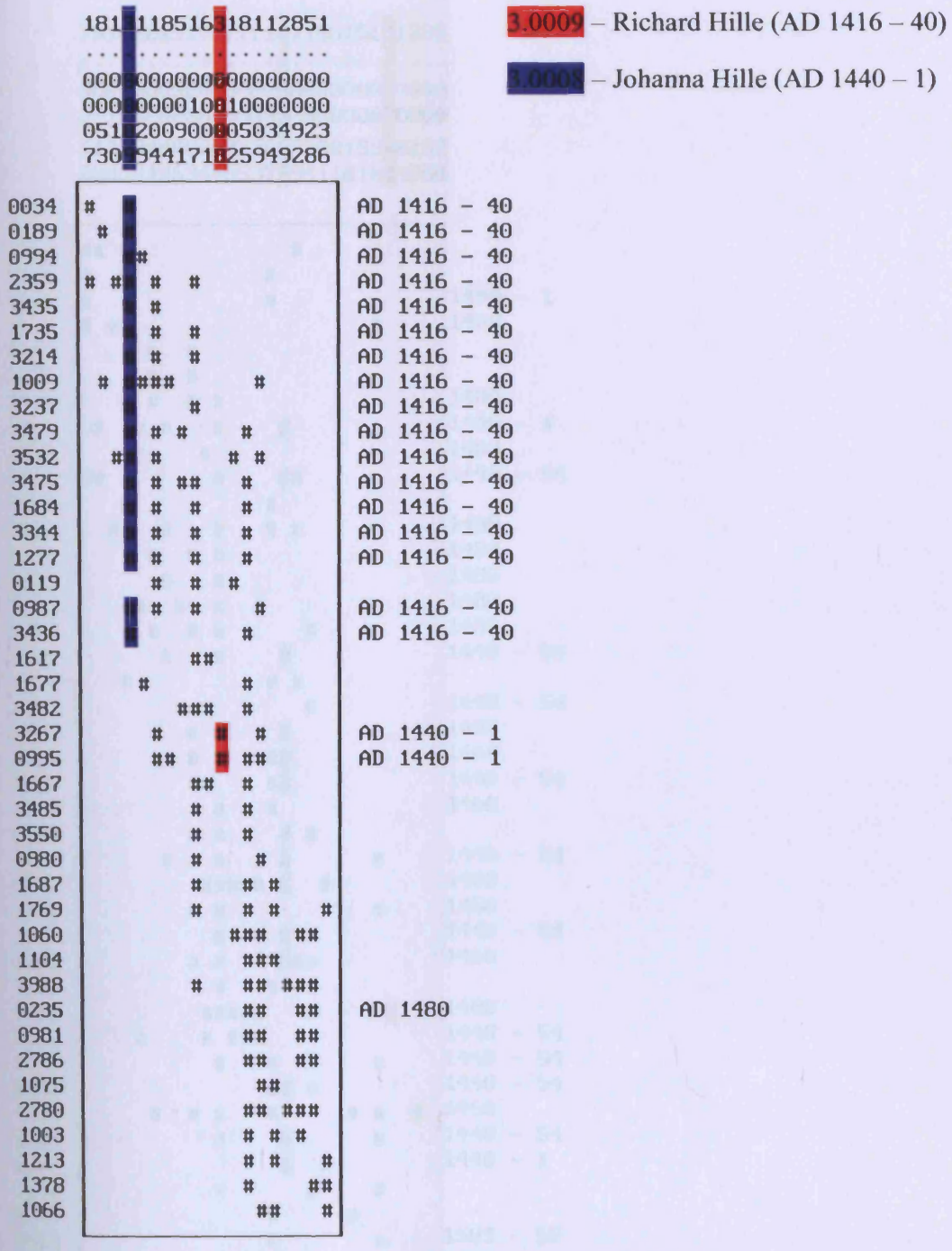


Figure 201: 'seriation' of cluster 11i produced by the correspondence analysis of units (Figs 87 and 129)

Input Correlation: 0.0881; Output Correlation: 0.8053; % Variance: 7.5590

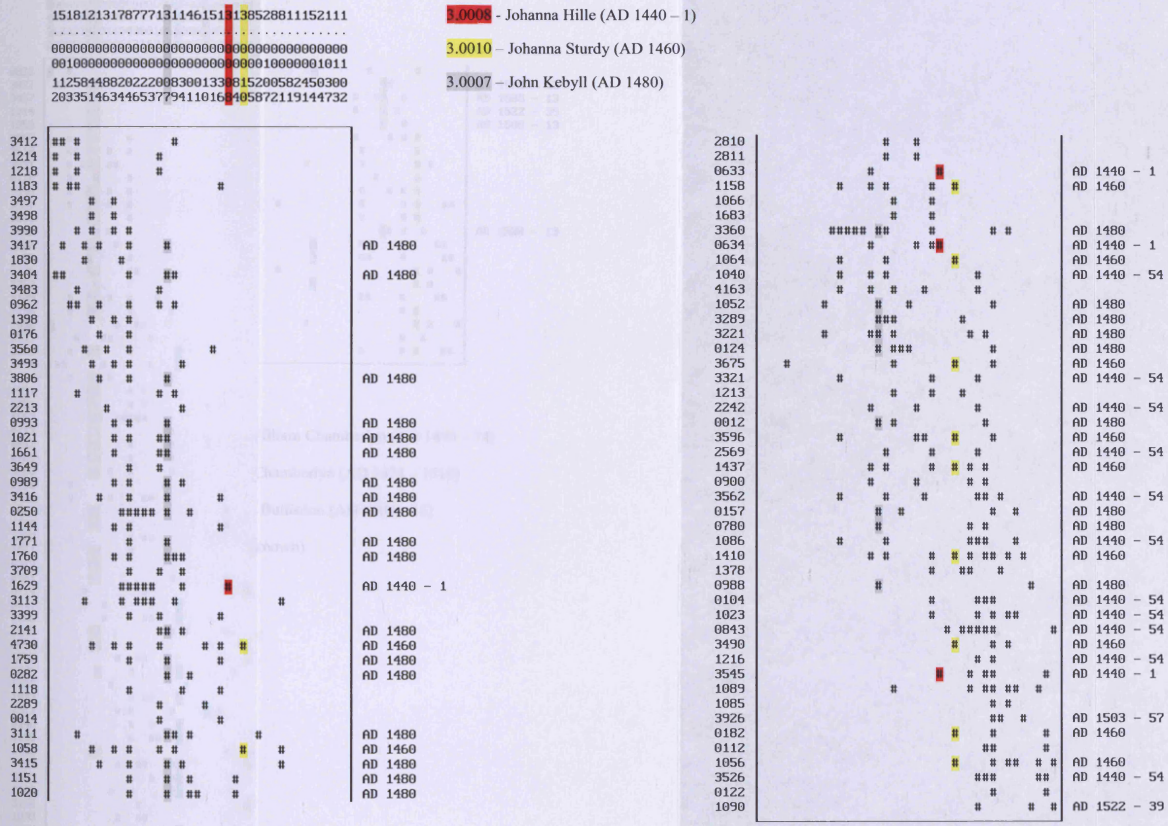


Figure 202: 'seriation' of cluster 11k produced by the correspondence analysis of units (Figs 87 and 130)

Input Correlation: 0.1861; Output Correlation: 0.8181; % Variance: 7.7308

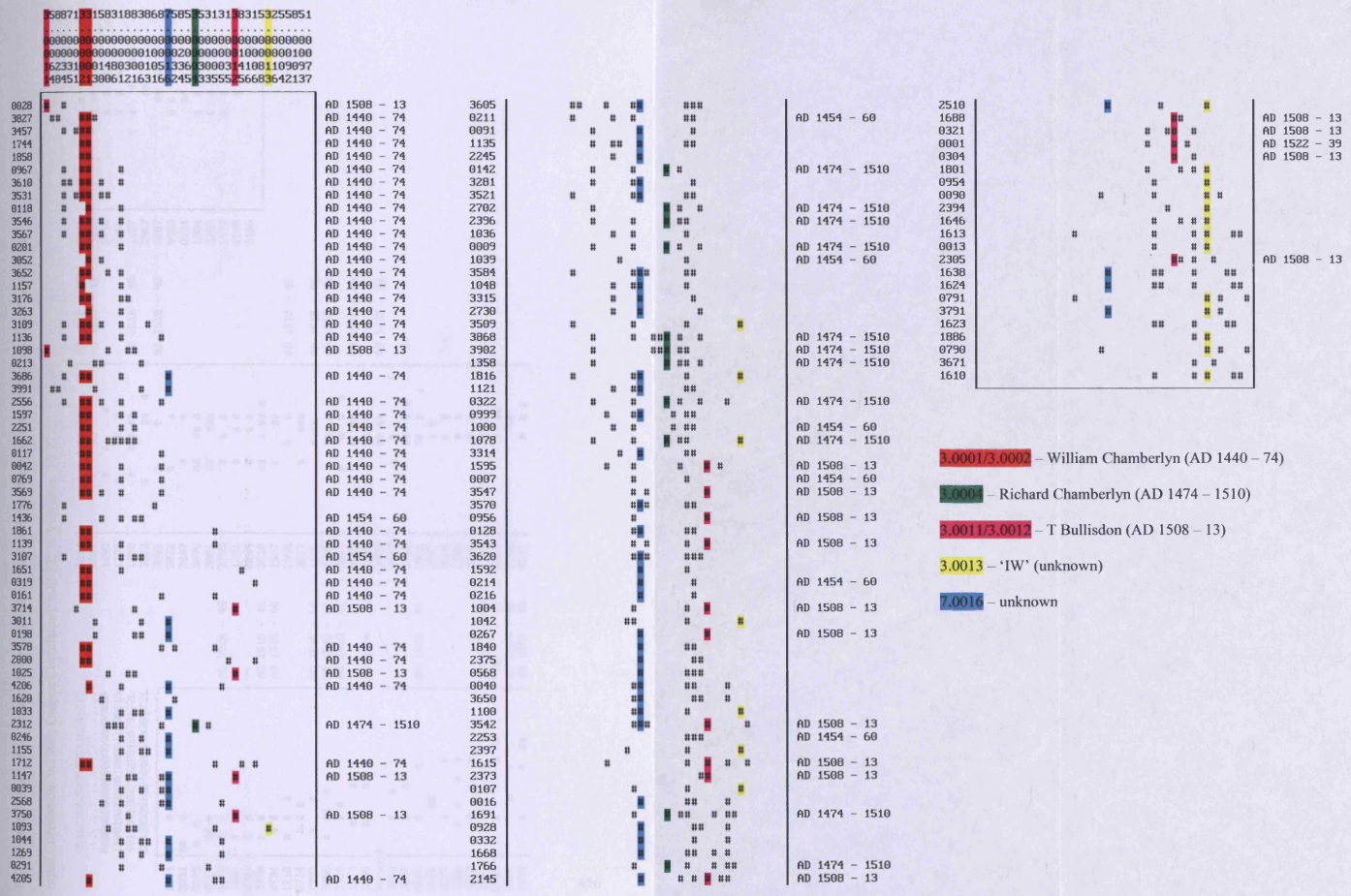


Figure 203: 'seriation' of cluster 19e produced by the correspondence analysis of units (Figs 87 and 143)

Input Correlation: 0.1908; Output Correlation: 0.8872; % Variance: 10.7725

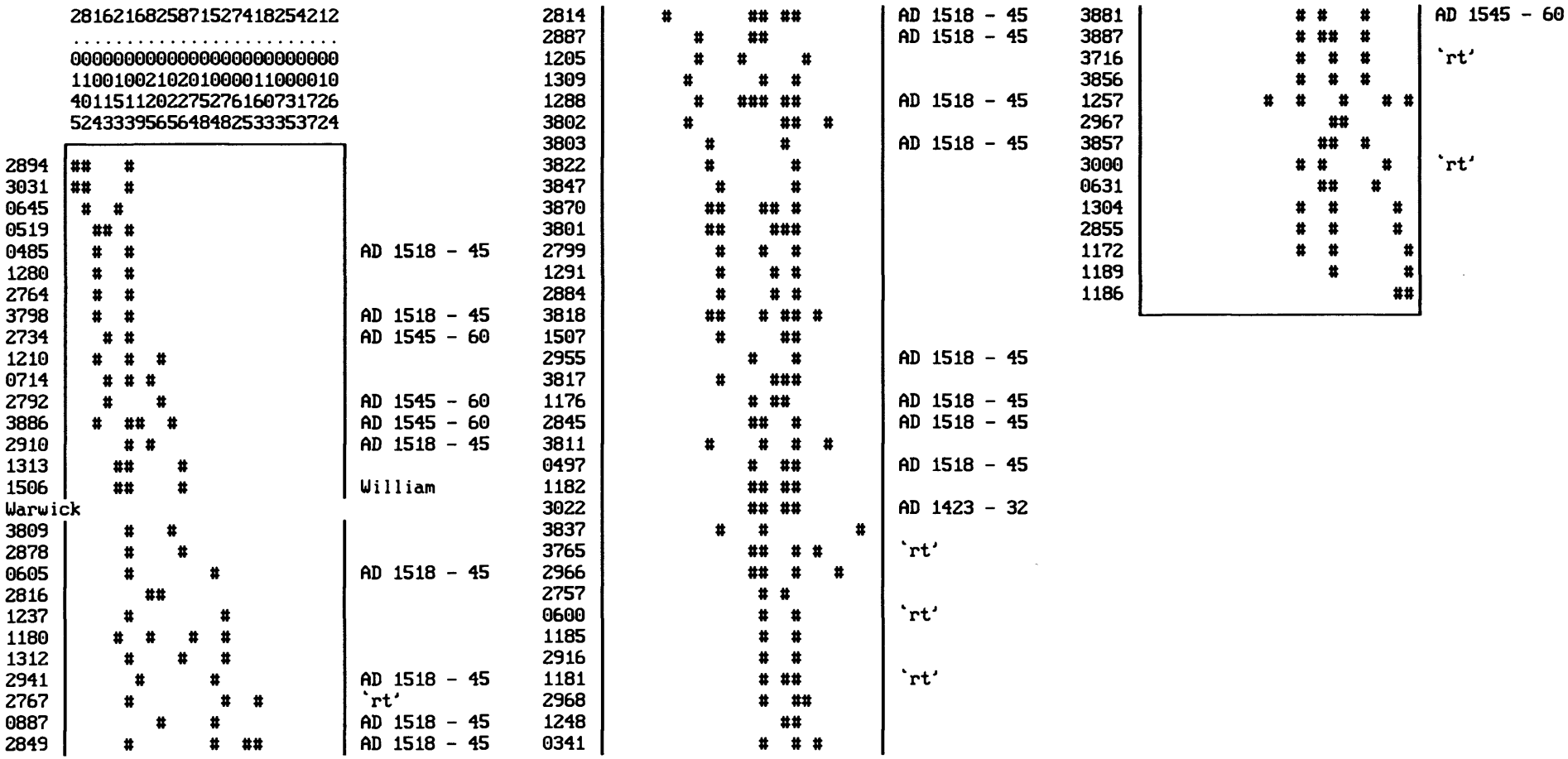


Figure 204: map of stamps produced by the correspondence analysis of cluster 11b of the partition of types

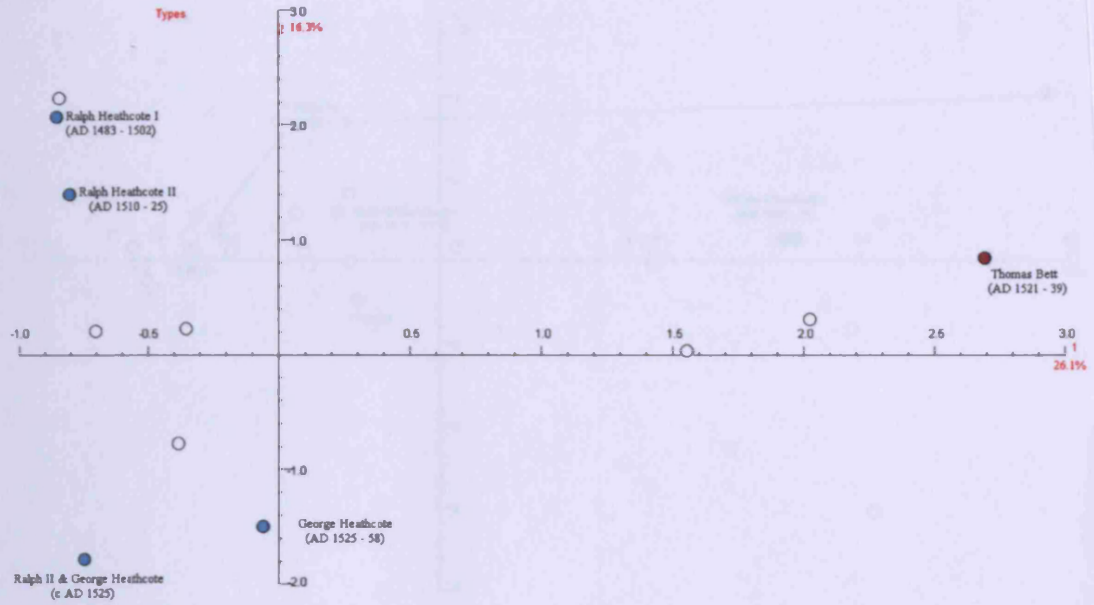


Figure 205: 'seriation' of cluster 11b produced by the correspondence analysis of types (Figs 159 and 204)

Input Correlation: 0.2113; Output Correlation: 0.8831; % Variance: 26.1361

```
          12323224041104404444004 4
          95040411419941147112447 1
          52394894148814566920618 7
          93337423727168226388159 2

3.0078  ###                      | Thomas Bett (AD 1521 - 39)
5.0041   ##  #                   |
3.0040  ########                 |
3.0036     # # #######           | George Heathcote (AD 1525 - 58)
5.0008     ####  ## ## ## #  ##  |
6.0011      ## ####### #  # ##   |
1.0055           ####  # ####    |
3.0028              # #          | George & Ralph II Heathcote (AD 1525)
3.0065                #  ## #   | Ralph II Heathcote (AD 1510 - 25)
1.0278                  #   ##   |
3.0025                     # #   | Ralph I Heathcote (AD 1483 - 1502)
```

Figure 206: map of stamps produced by the correspondence analysis of cluster 16f of the partition of types

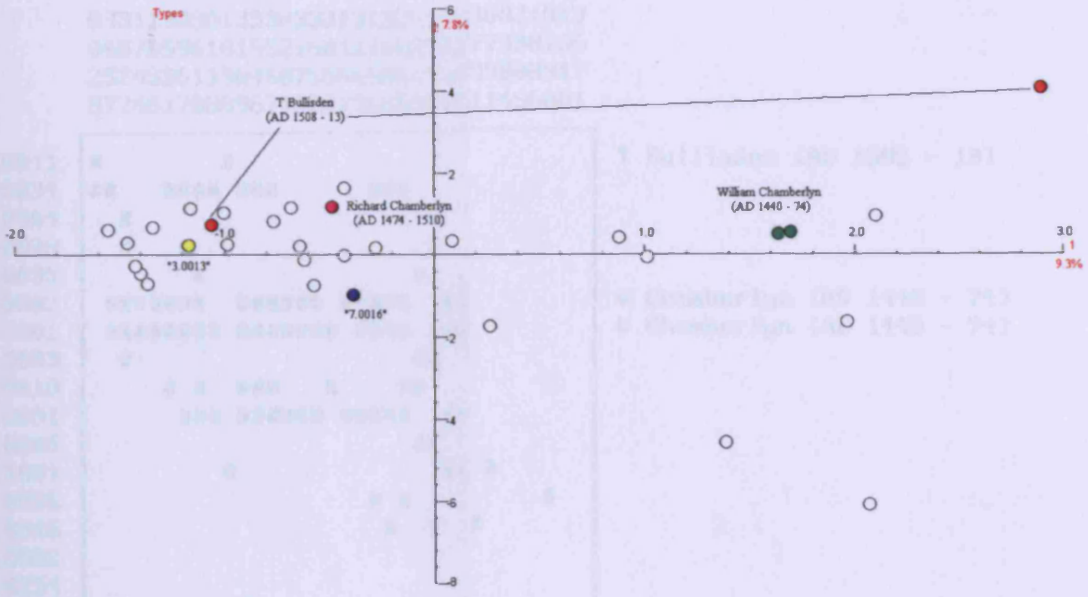


Figure 207: 'seriation' of cluster 16f produced by the correspondence analysis of types (Figs 159 and 206)

Input Correlation: 0.1972 Output Correlation: 0.8300 % Variance: 9.3482

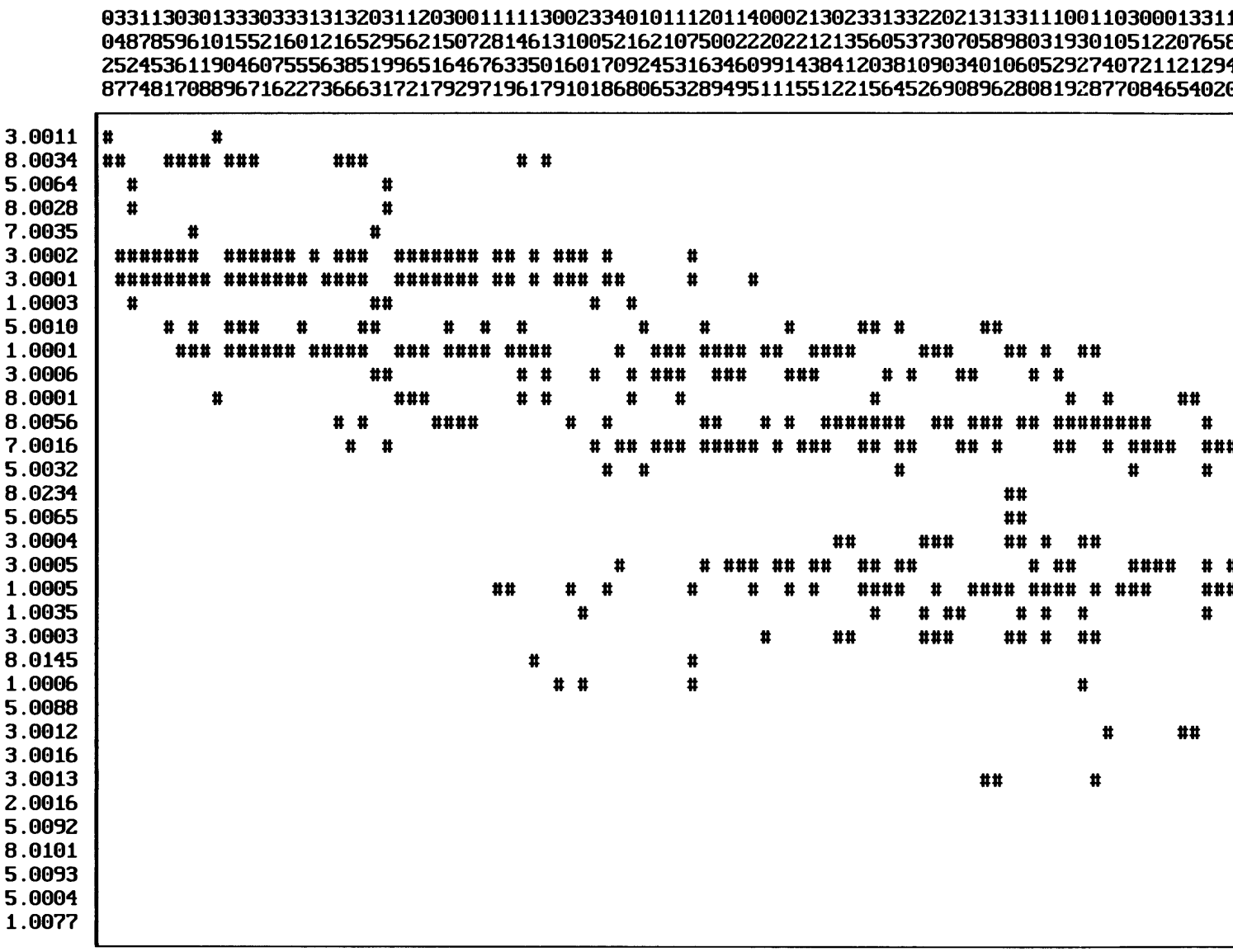


Figure 208: map of stamps produced by the correspondence analysis of cluster 16d of the partition of types

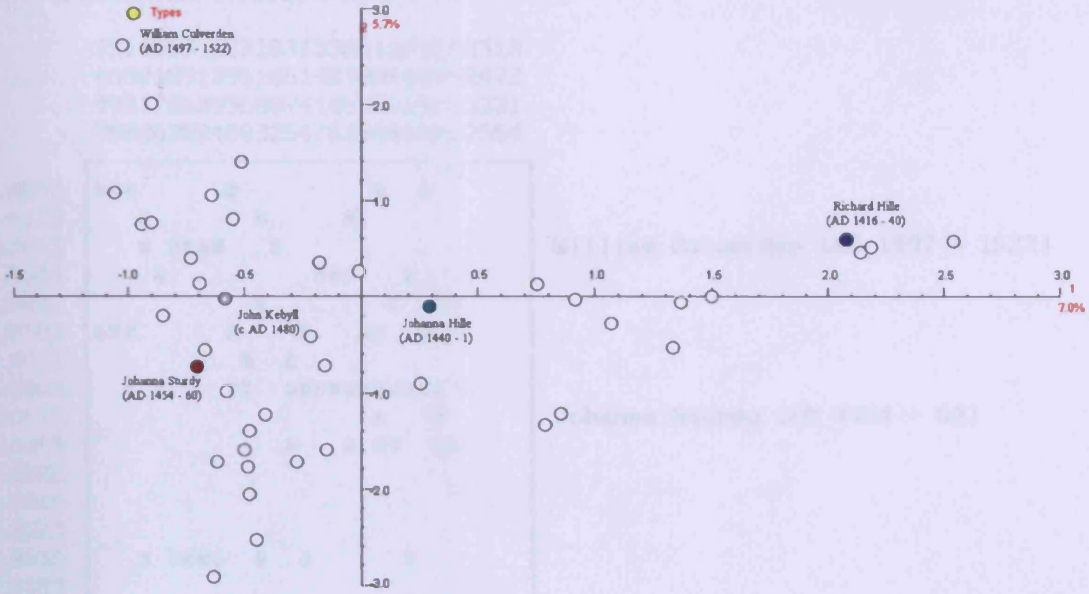


Figure 209: 'seriation' of cluster 16d produced by the correspondence analysis of types (Figs 159 and 208)

Input Correlation: 0.1015; Output Correlation: 0.8825; % Variance: 6.9938

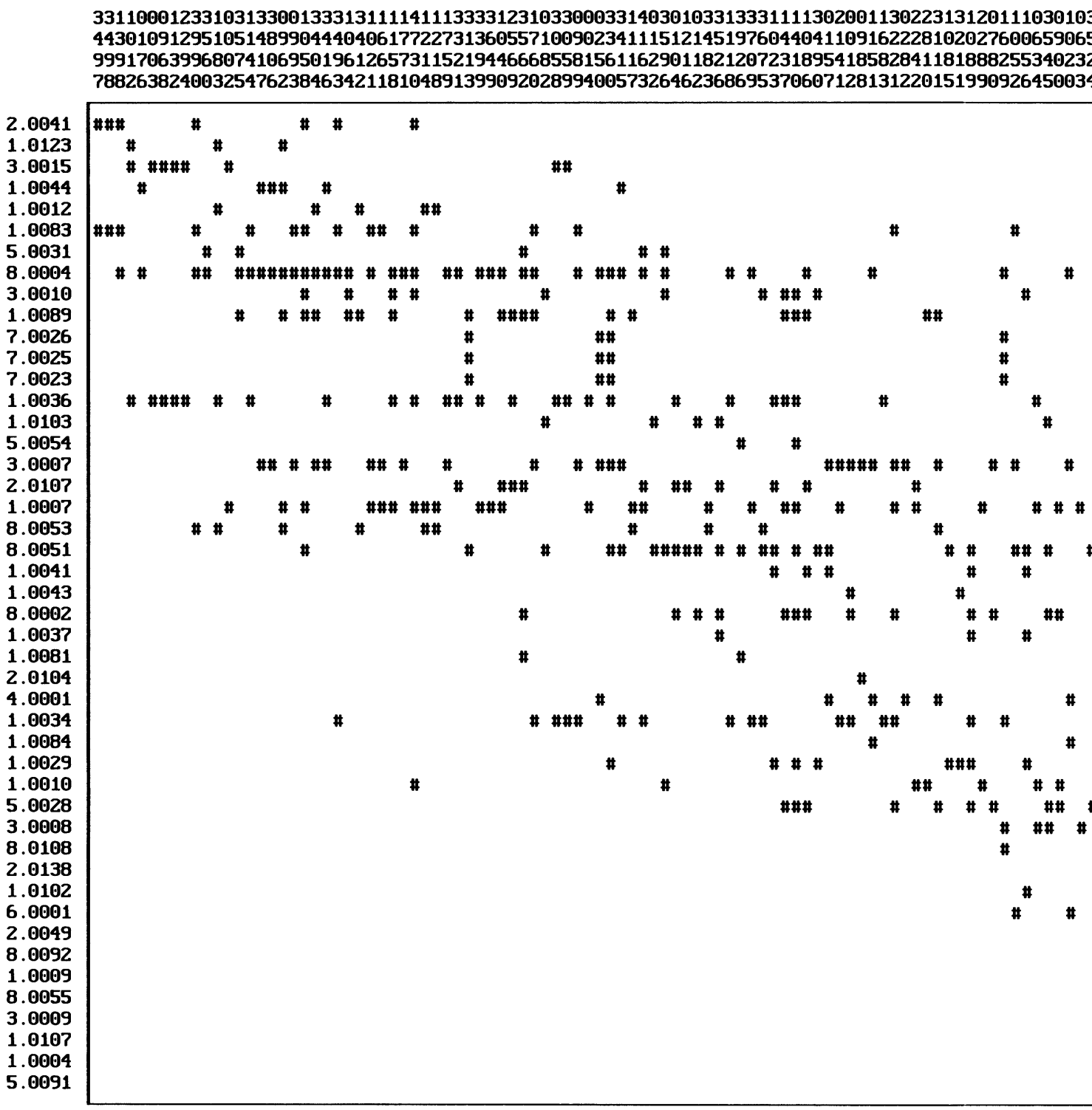


Figure 210: description of trades of 129 founders certainly known to have cast bells

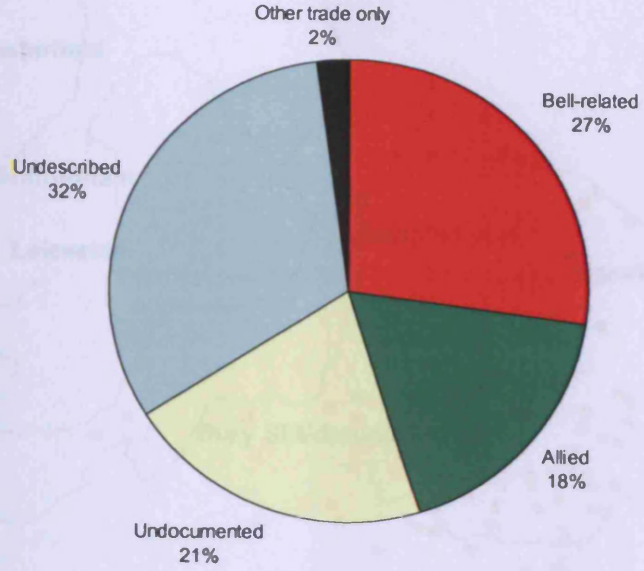


Figure 211: proportion of terms used to describe probable bellfounders in documents (*c* 1225 – 1550)

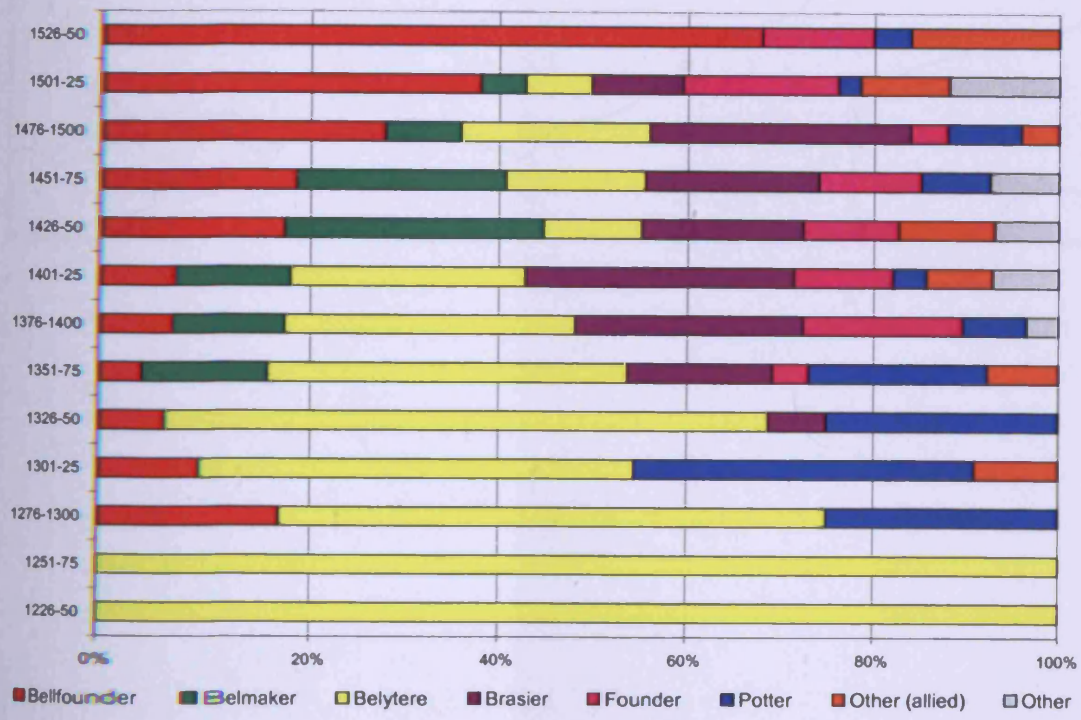


Figure 213: map showing bells cast by founders based in Norwich in the medieval period (■ cluster 6d; ■ cluster 6c; ■ cluster 6b)

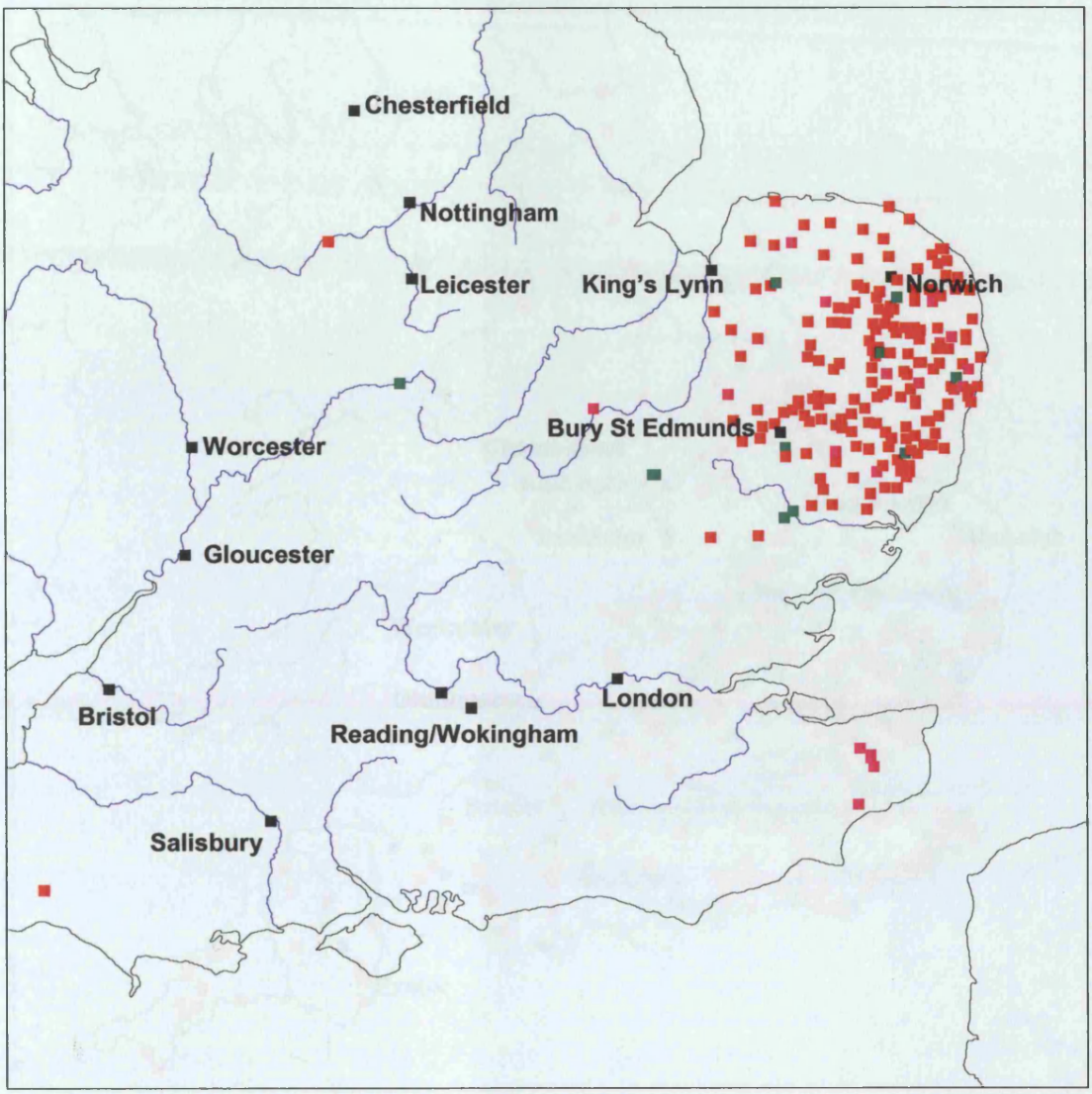


Figure 212: map showing bells cast by founders based at Bury St Edmunds in the medieval period (■ cluster 5b; ■ cluster 5a; ■ cluster 5 only)

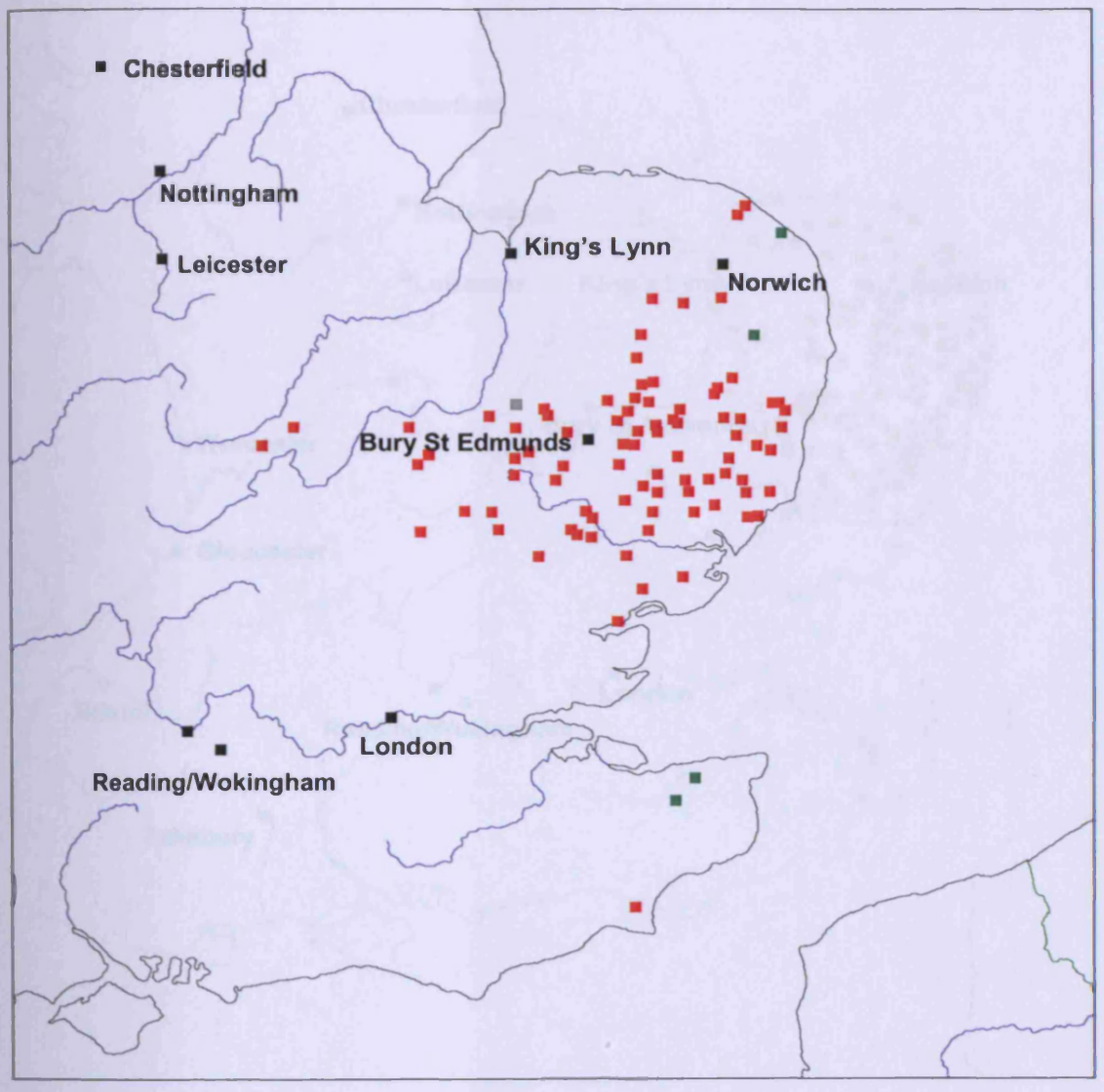


Figure 214: map showing bells cast by founders based in London in the medieval period (■ cluster 11f; ■ cluster 11e; ■ cluster 11d; □ cluster 11c; □ cluster 11b; □ cluster 11a)

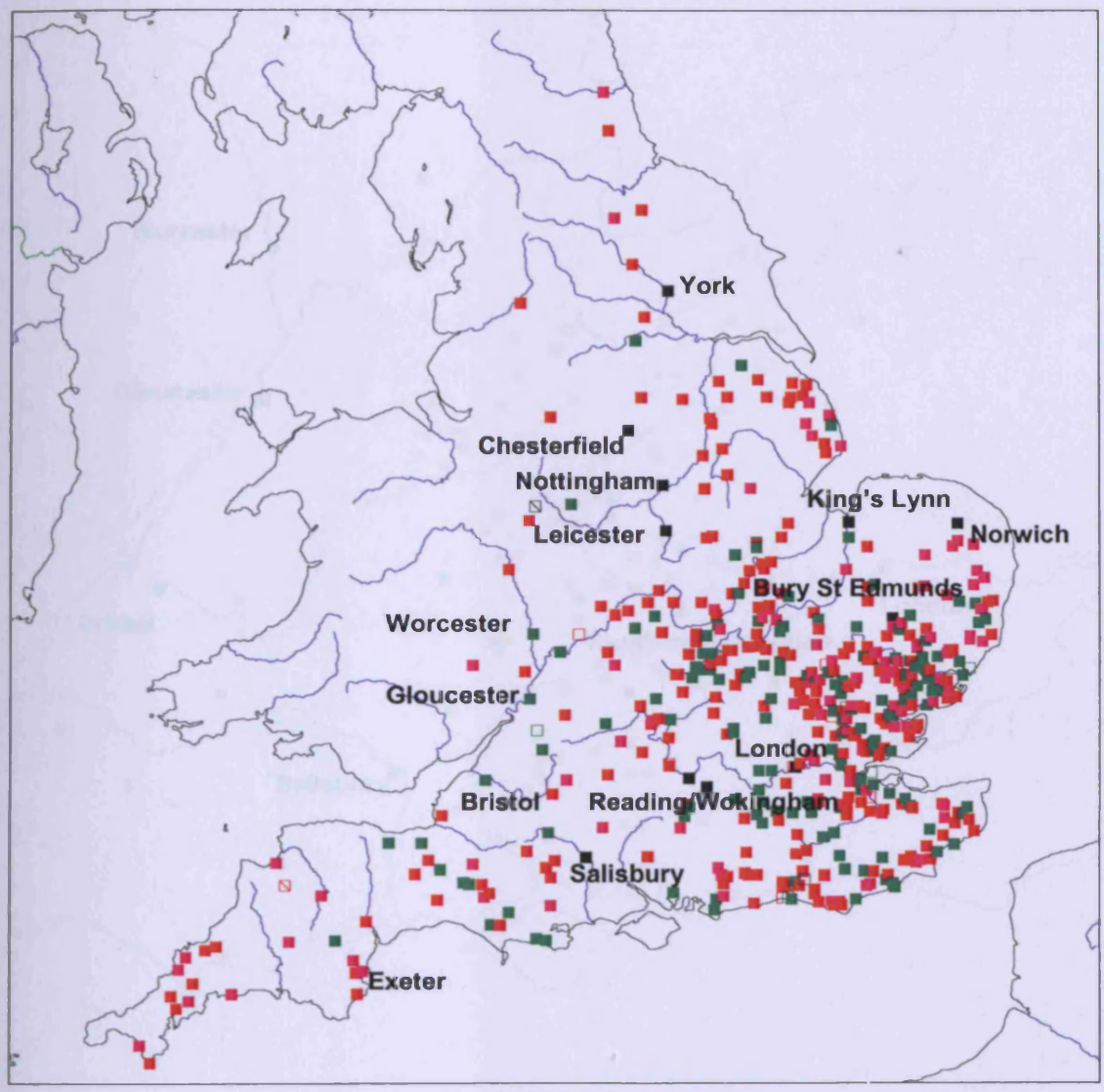


Figure 215: map showing bells cast by founders based in Reading/Wokingham in the medieval period (■ cluster 10c; ■ cluster 10b; ■ cluster 10a)

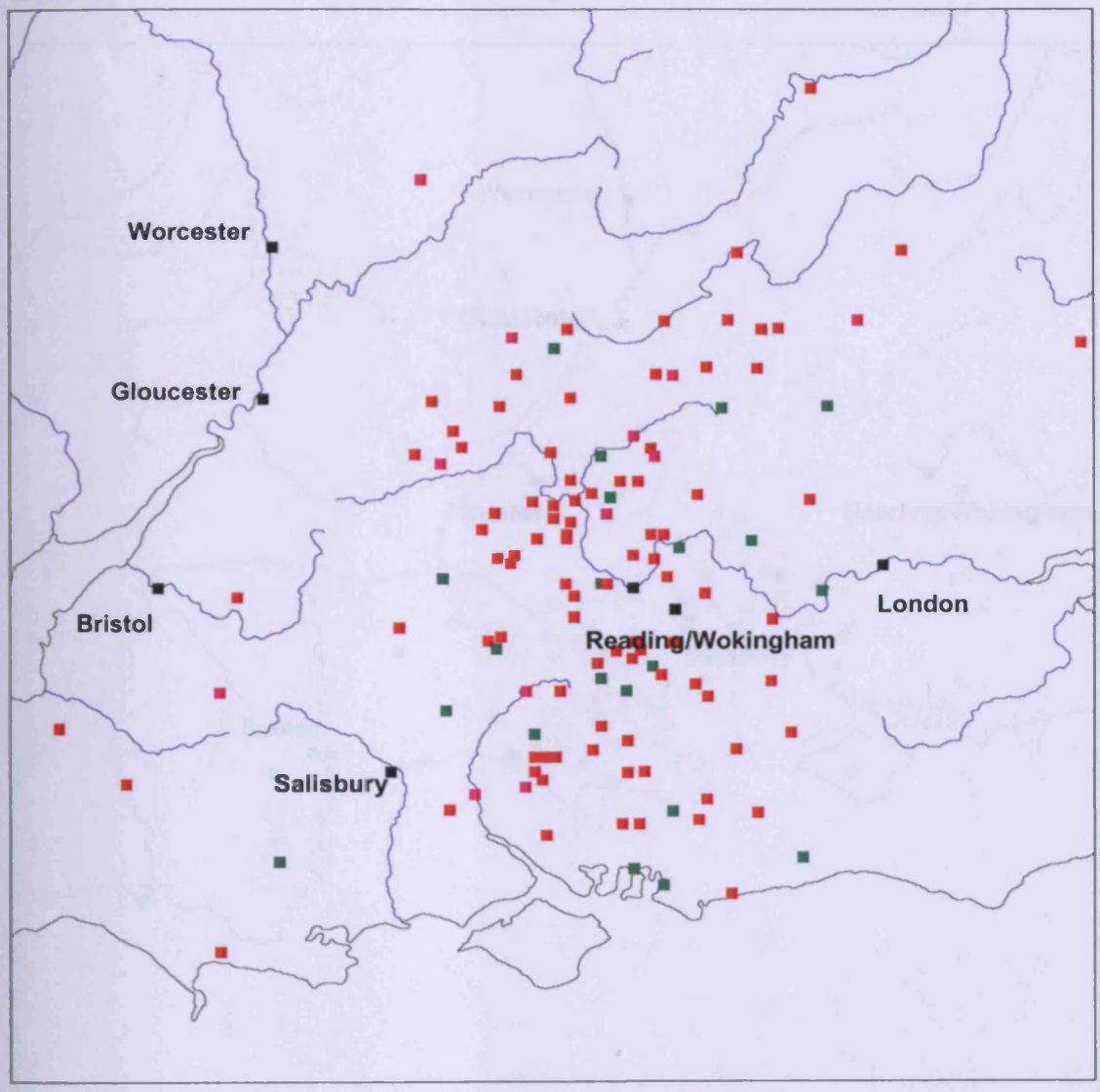


Figure 216: map showing bells cast by founders probably based in Salisbury in the medieval period (■ cluster 14d; □ cluster 14c; □ cluster 14c; ■ cluster 14a; ■ cluster 13; □ cluster 4)

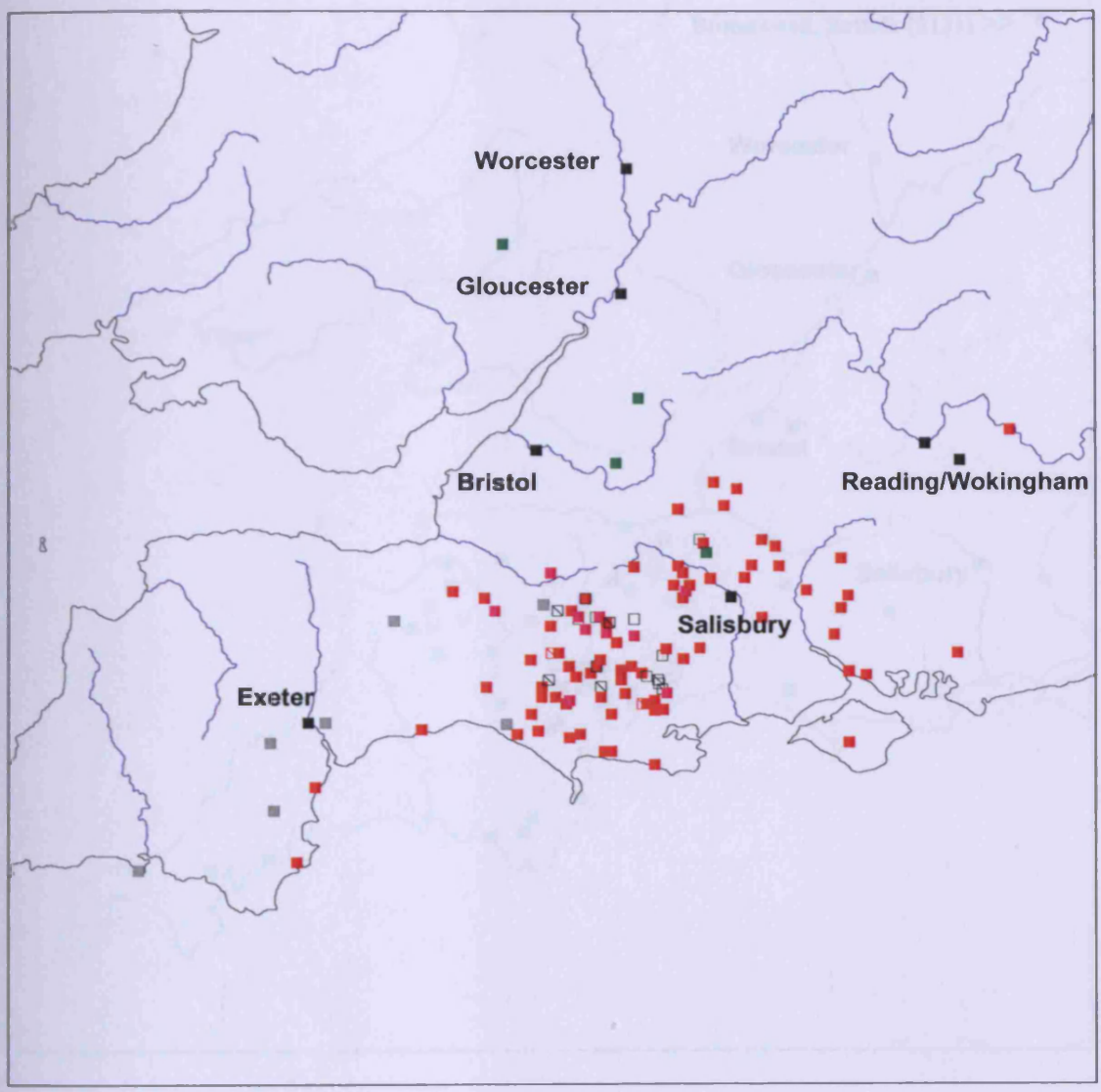


Figure 217: map showing bells cast by founders based in Exeter in the medieval period (□ cluster 18b; ■ cluster 18a; ■ cluster 18 only)

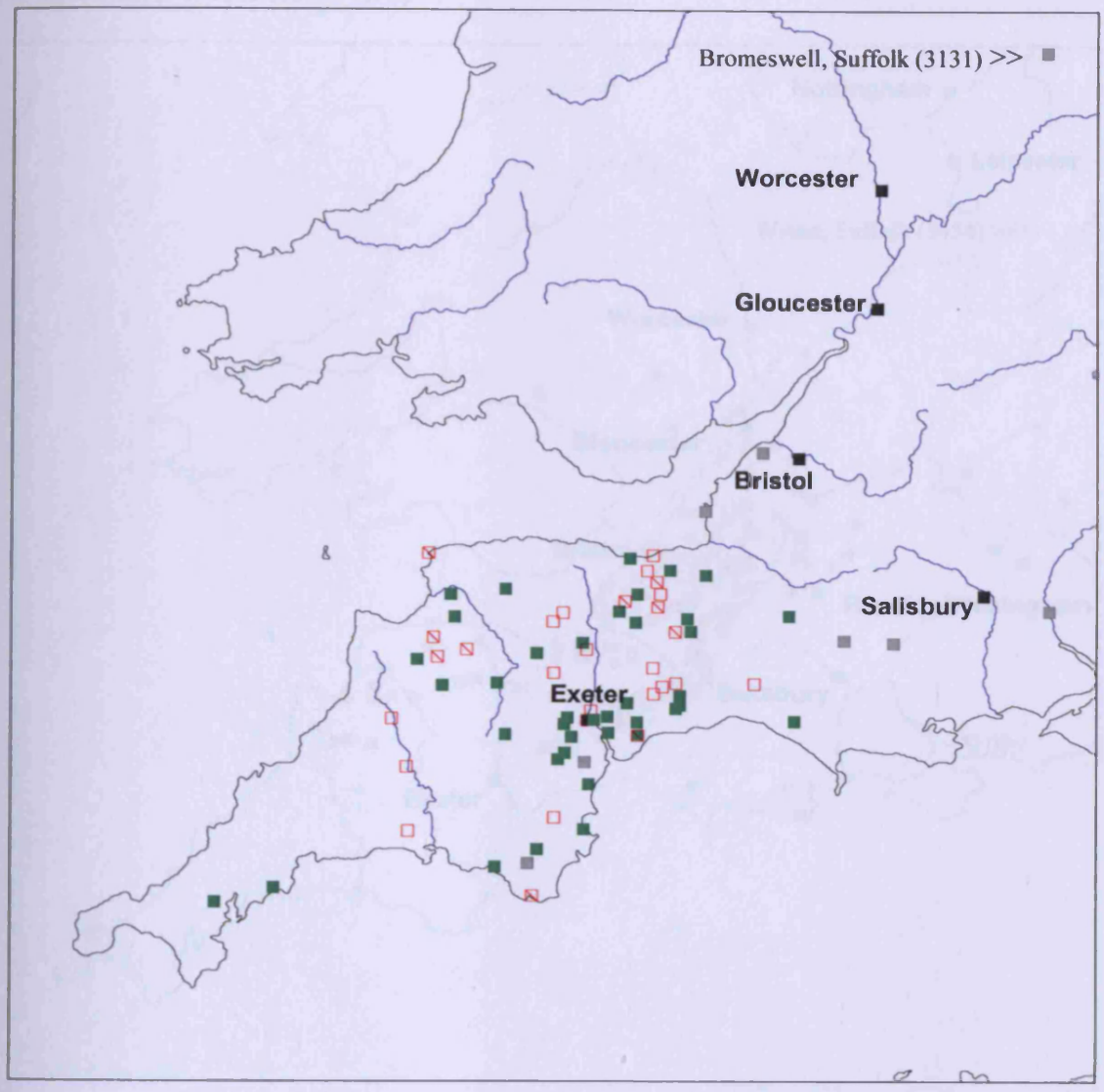


Figure 218: map showing bells cast by founders based in Bristol or surrounding districts in the medieval period (■ cluster 16; ■ cluster 19e; ■ cluster 19d; ■ cluster 19c; □ cluster 19b; □ cluster 19a; □ cluster 21b)

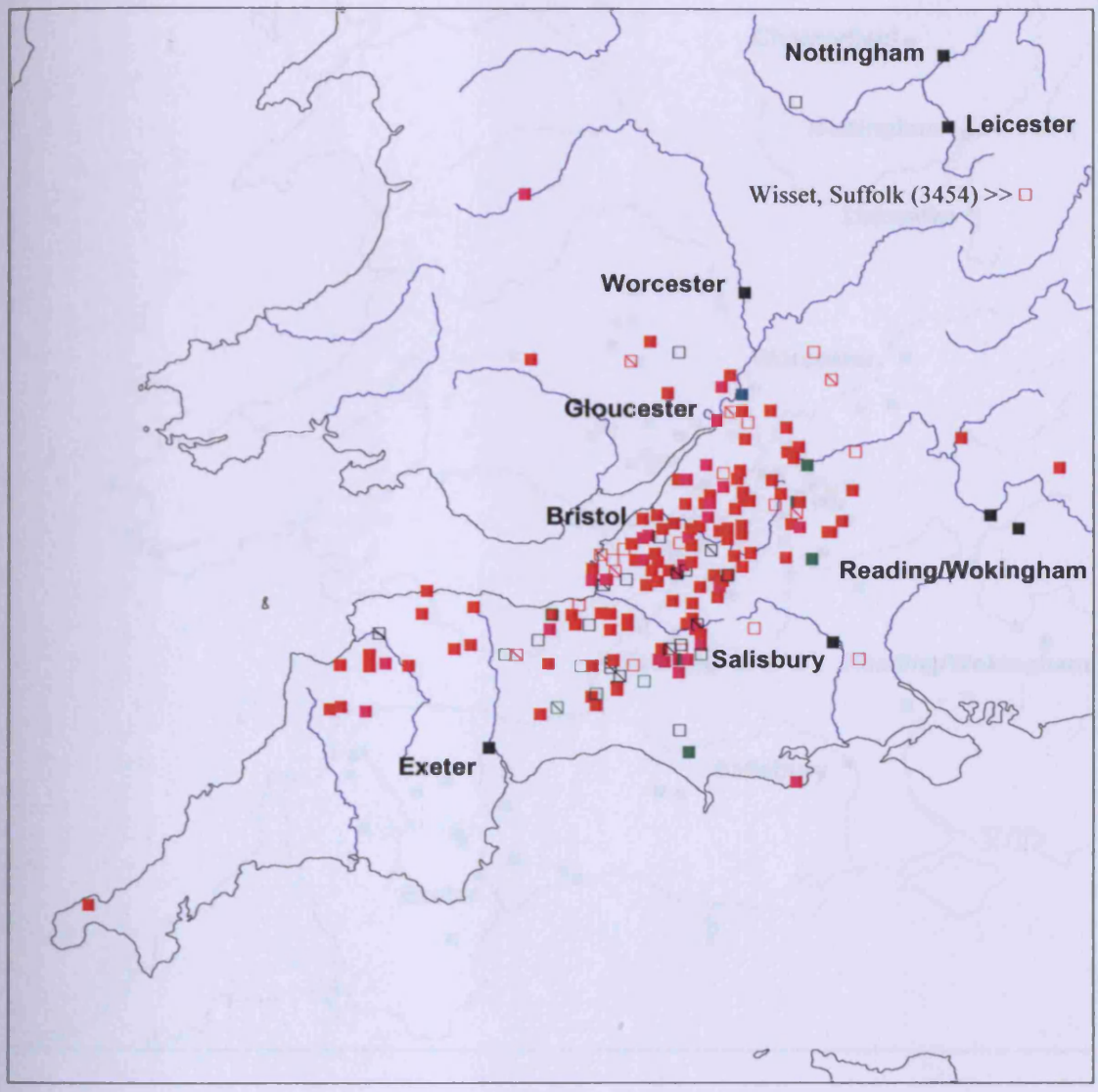


Figure 219: map showing bells cast by founders probably based in Gloucester in the medieval period ■ cluster 17; ■ cluster 18c)

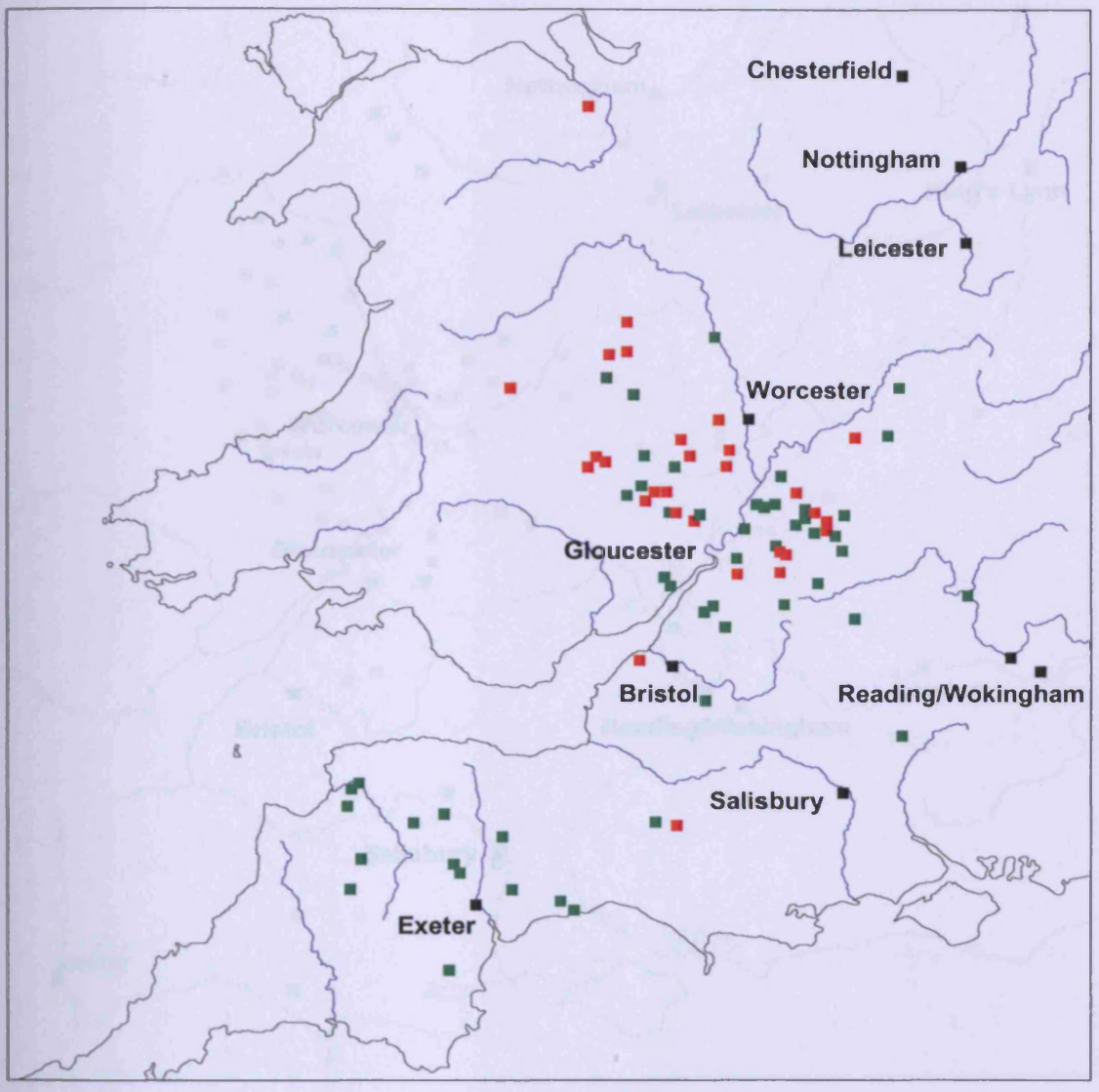


Figure 220: map showing bells cast by founders probably based in Worcester in the medieval period (□ cluster B; ■ cluster 2; ■ cluster 23; ■ cluster 31a)

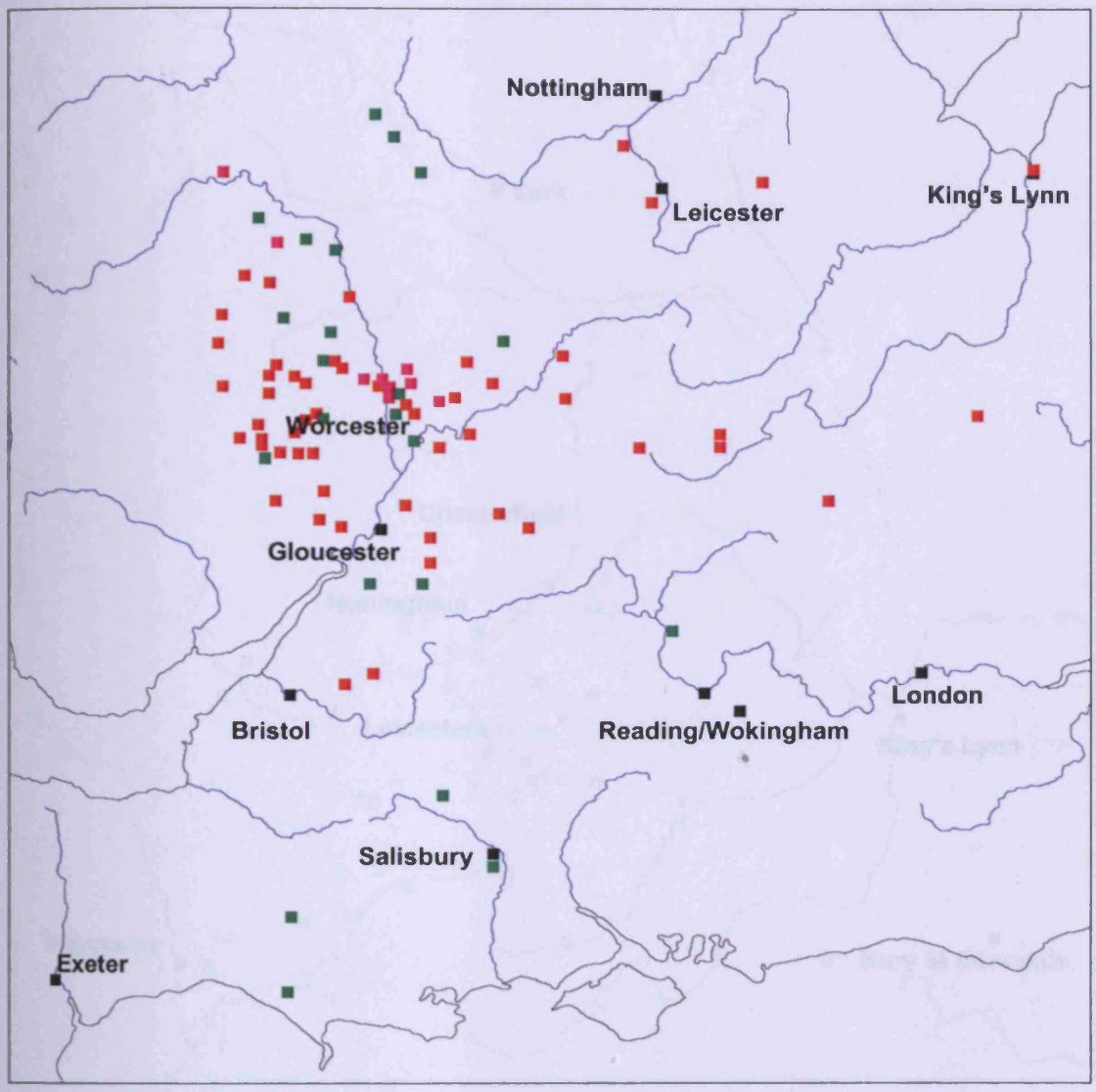


Figure 221: map showing bells cast by founders probably based in Leicester in the medieval period (■ cluster 8; □ cluster 9a; □ cluster 12; □ cluster 21a)

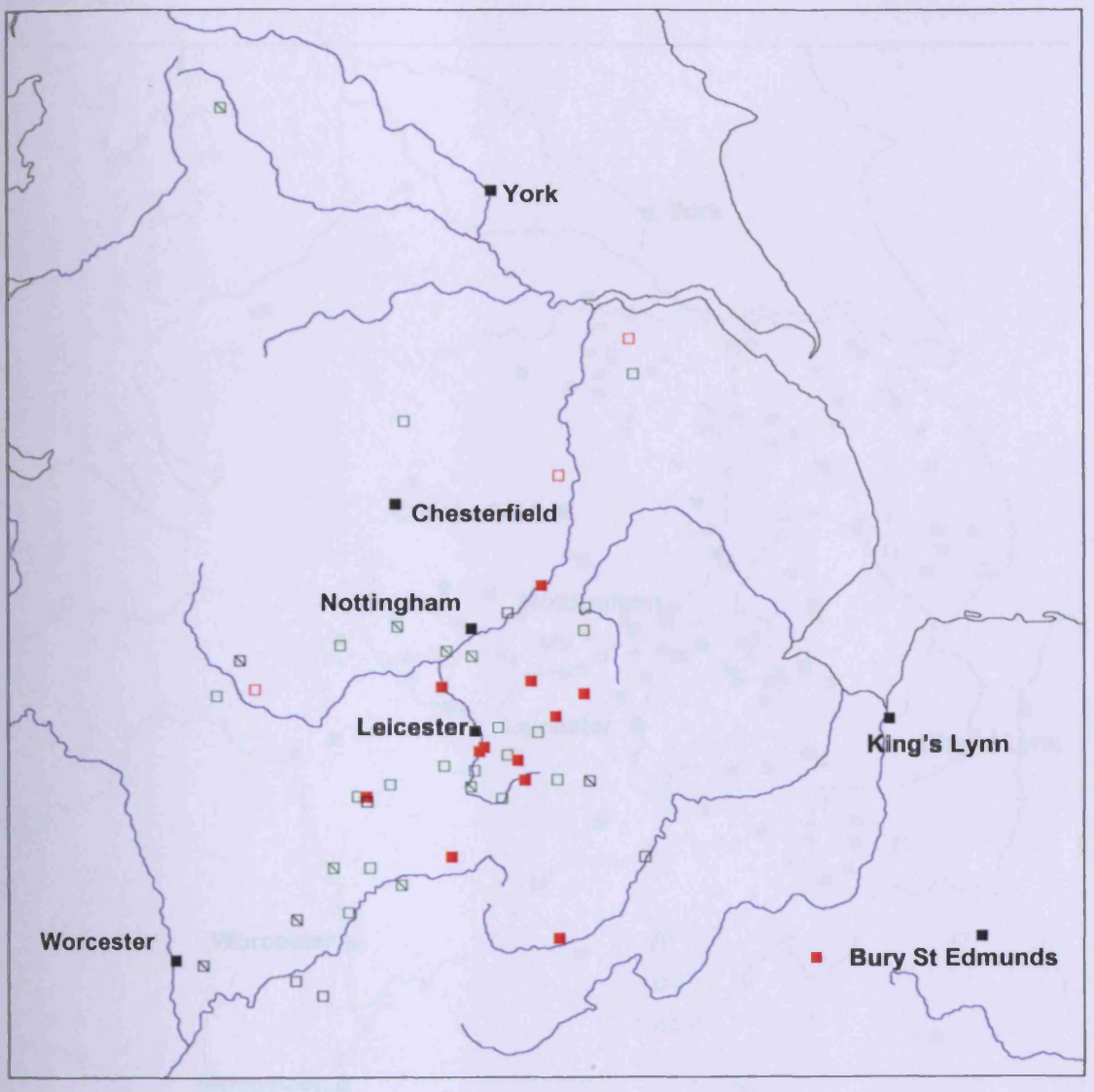


Figure 222: map showing bells cast by founders probably based in Nottingham in the medieval period (■ cluster 1; □ cluster 7d; ■ cluster 7e; ■ cluster 24b; □ cluster 27; □ cluster 30b)

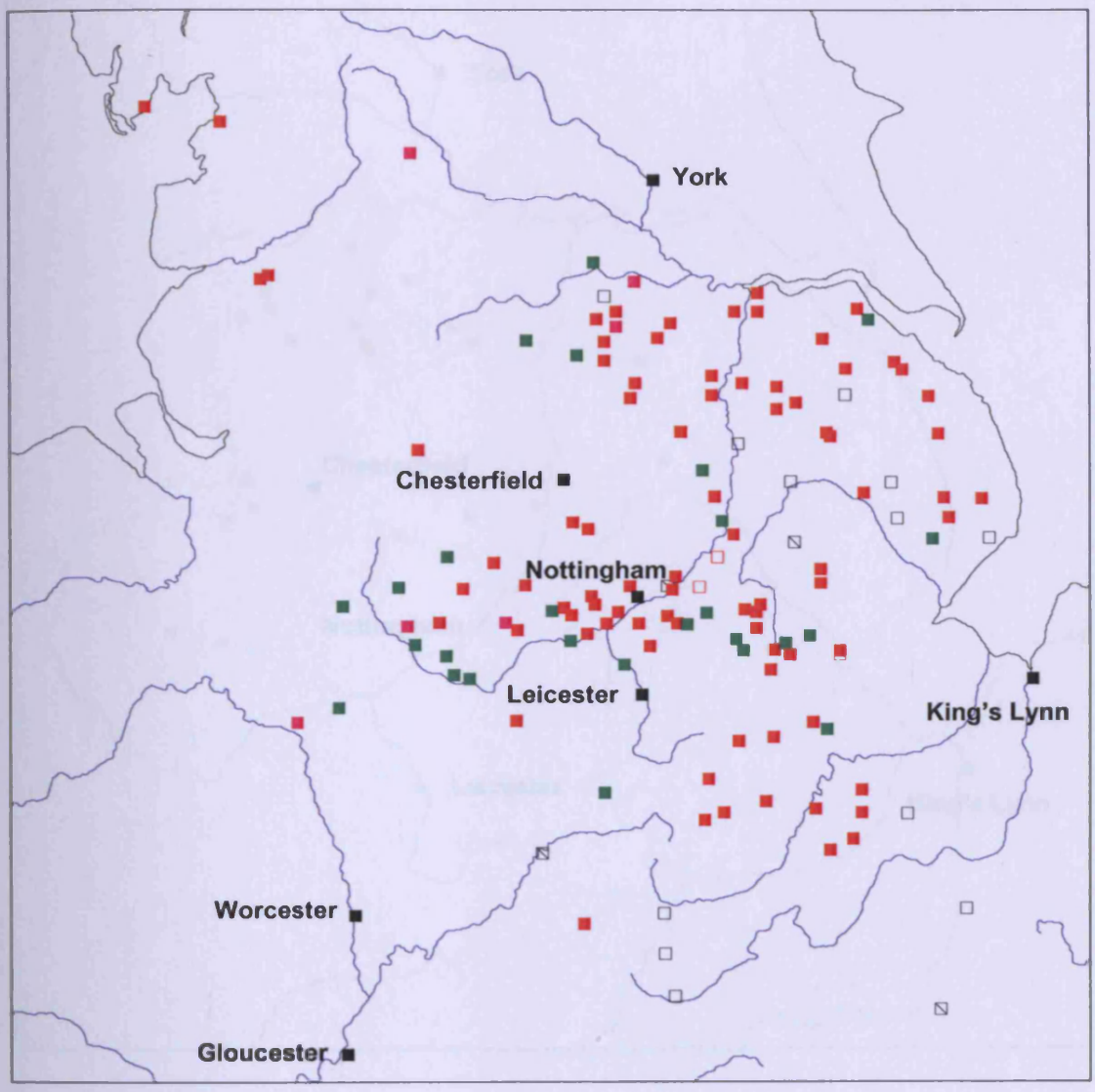


Figure 223: map showing bells cast by founders based in Chesterfield in the medieval period (■ cluster 9d)

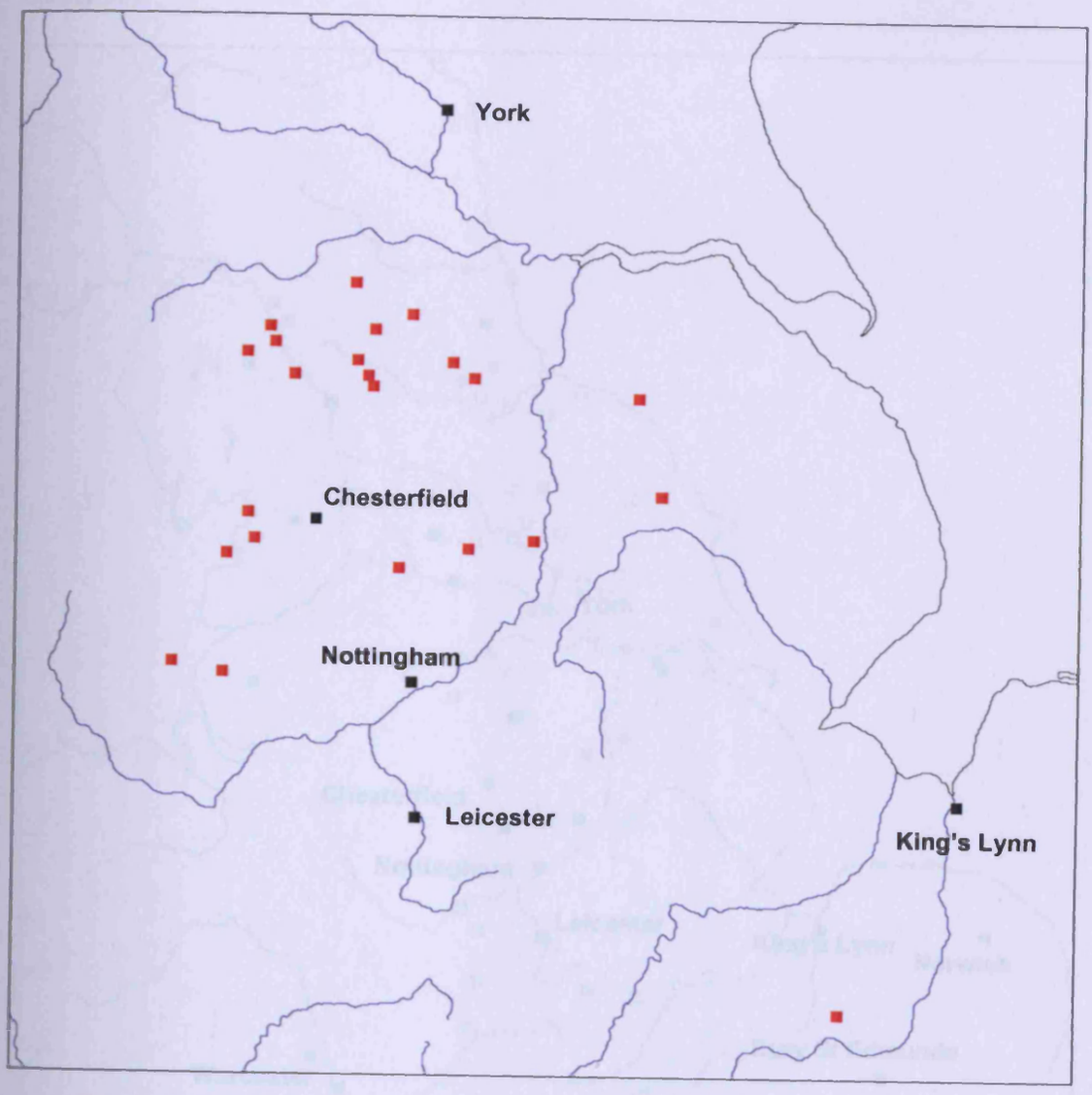


Figure 224: map showing bells cast by founders based in York or surrounding districts in the medieval period (■ cluster A; □ cluster B; □ cluster 6a; ■ cluster 7c; □ cluster 7b; ■ cluster 9c)

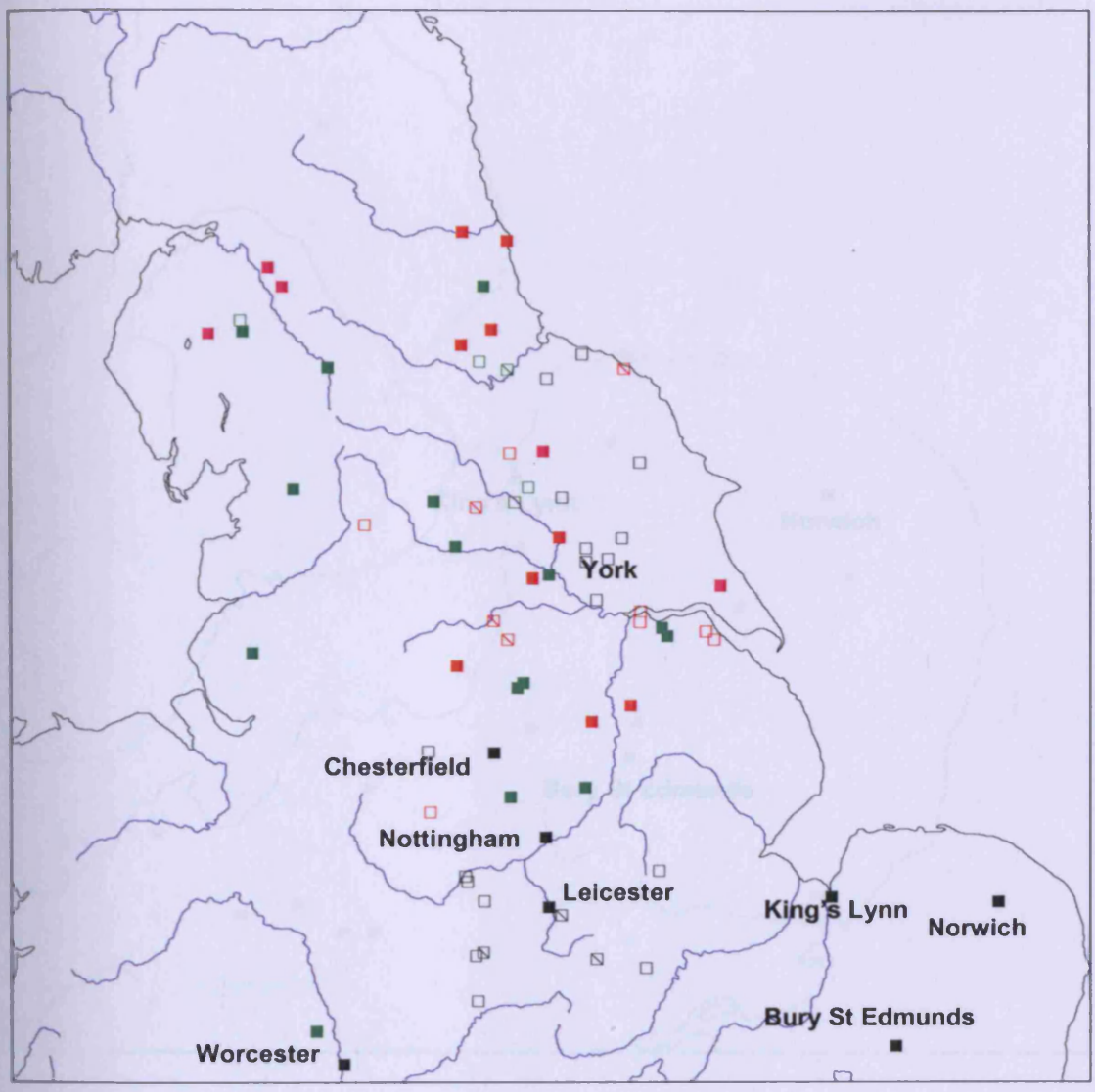


Figure 225: map showing bells in cluster 29 (■), including bells by founders based in King's Lynn and Toddington, Bedfordshire in the medieval period

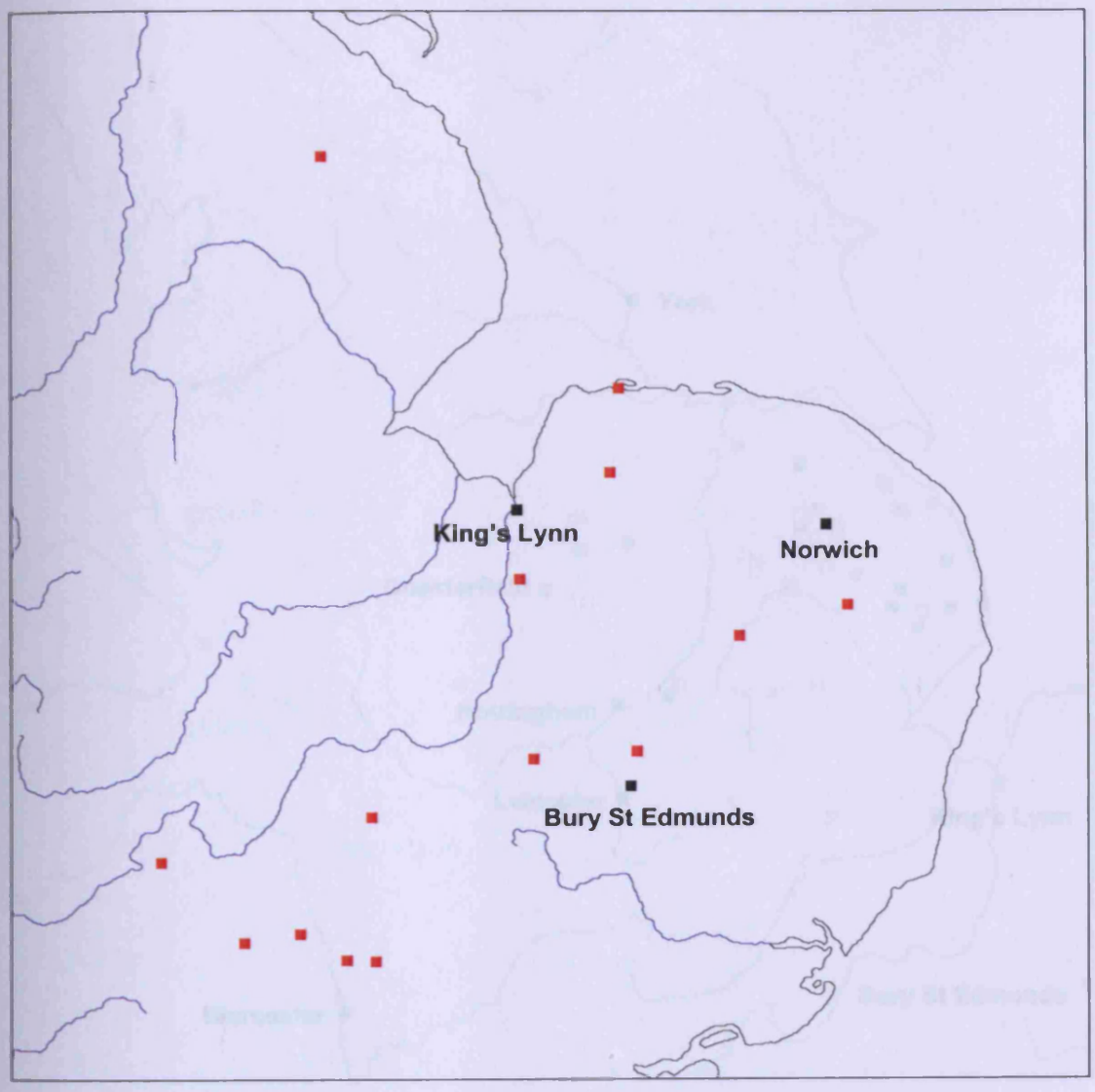


Figure 226: map showing bells cast by founders based in Lincolnshire in the medieval period (■ cluster C; ■ cluster 7a; □ cluster 24a; ■ cluster 30a)

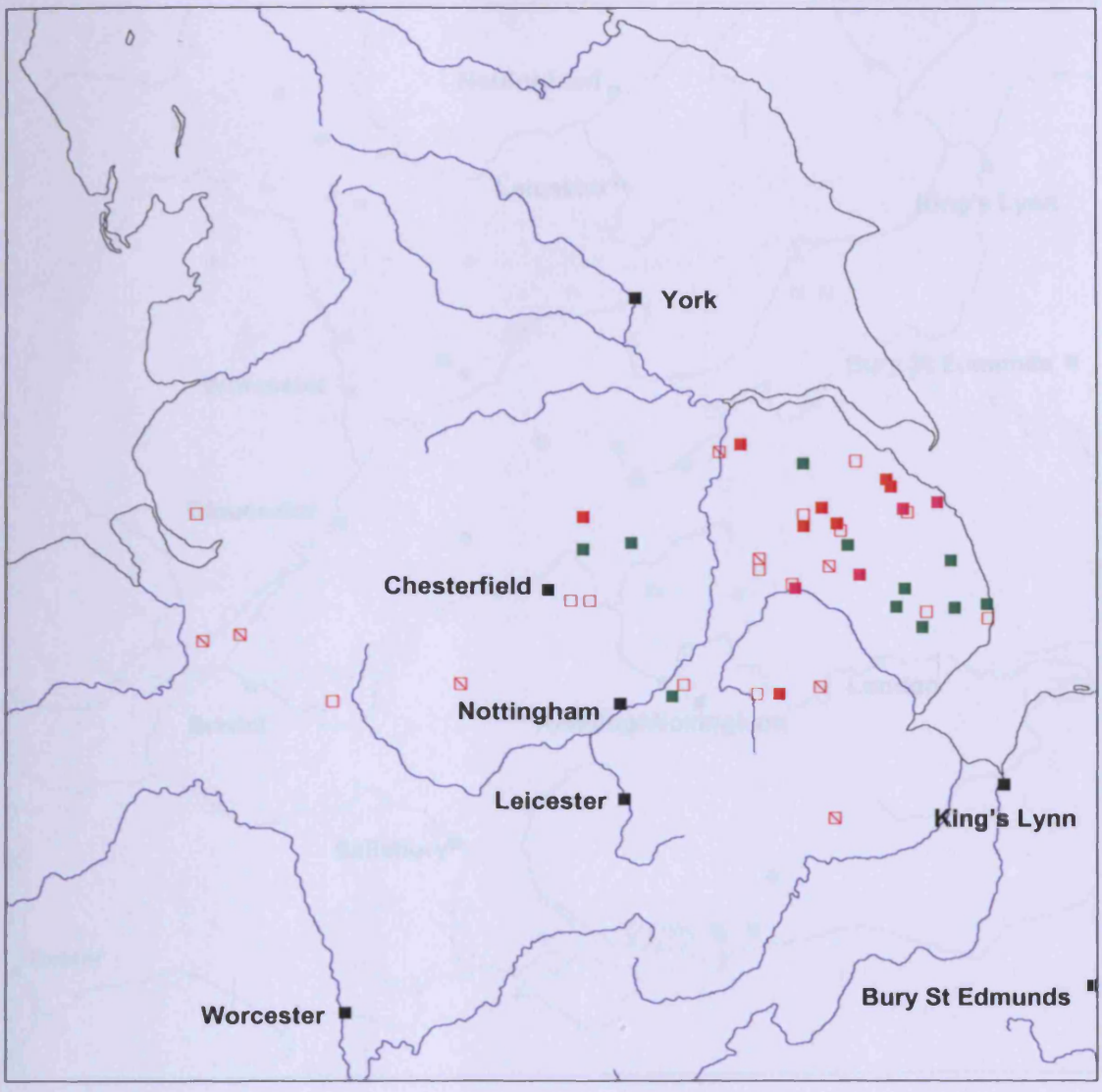


Figure 227: map showing bells cast by founders based in the Midlands in the medieval period (■ cluster D; □ cluster 15; ■ cluster 20; □ cluster 25; ■ cluster 26; □ cluster 28)

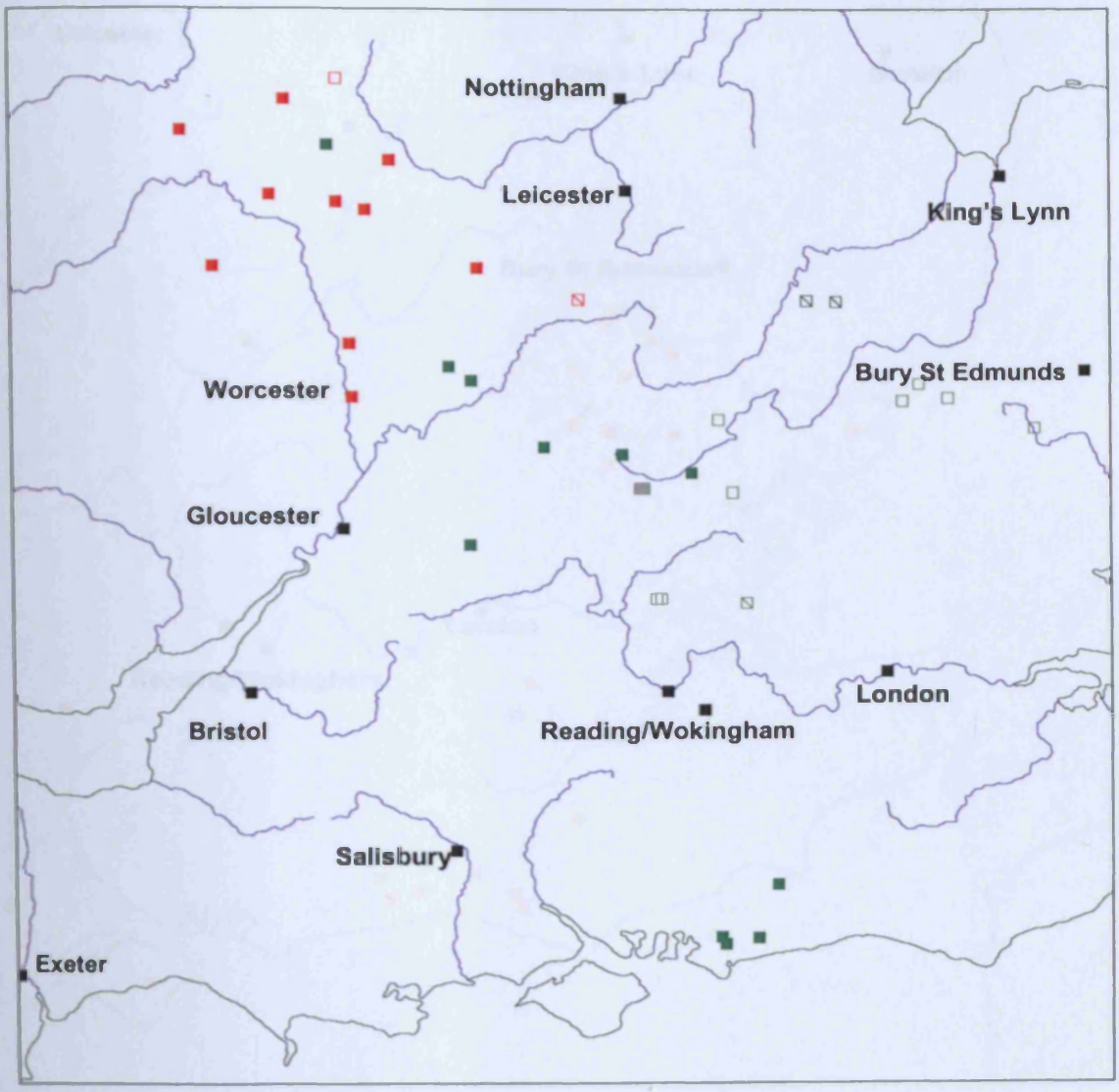


Figure 228: map showing bells cast by John Tonne and Thomas Harrys of London (■ cluster 3; ■ cluster 22)

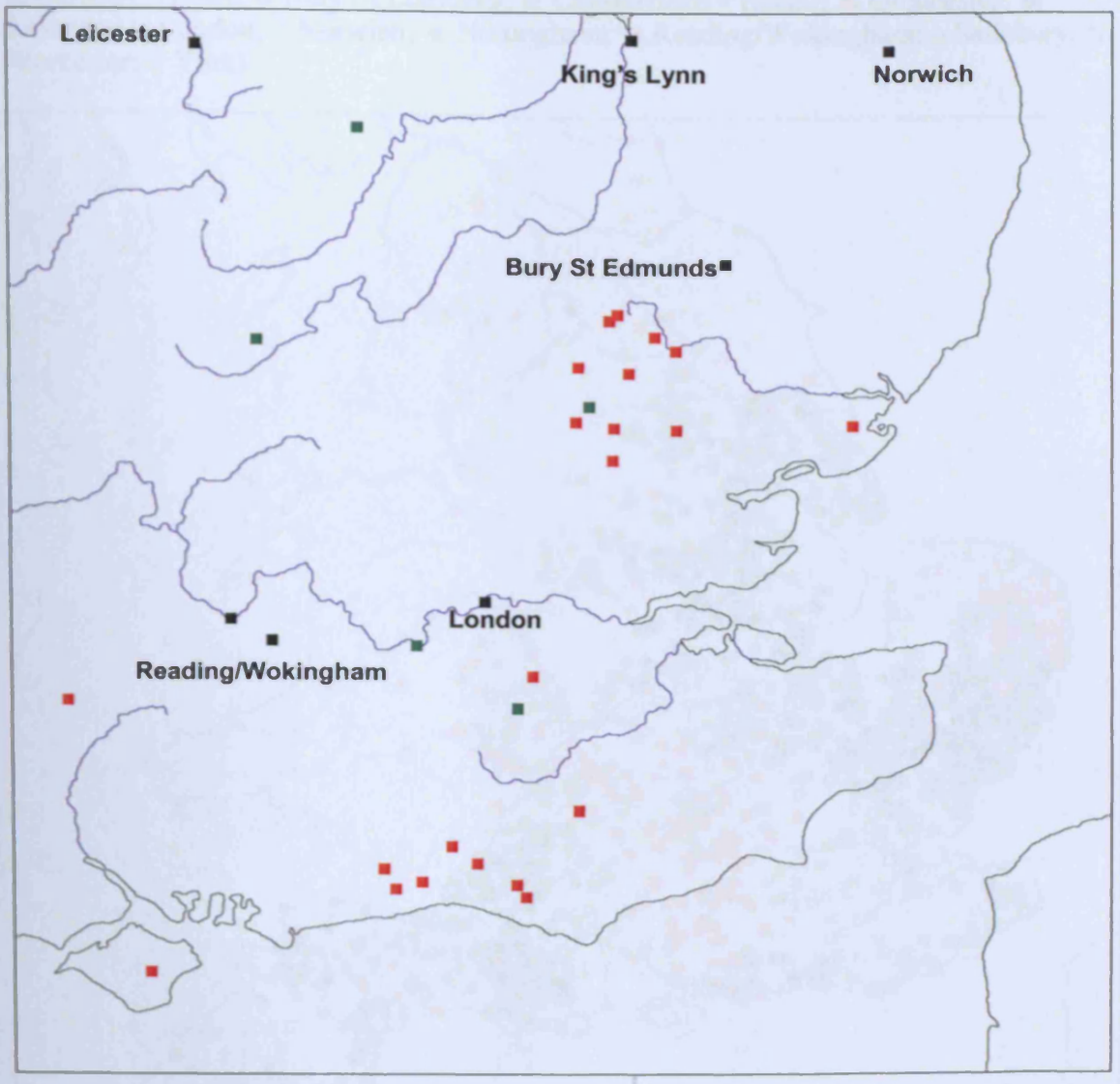
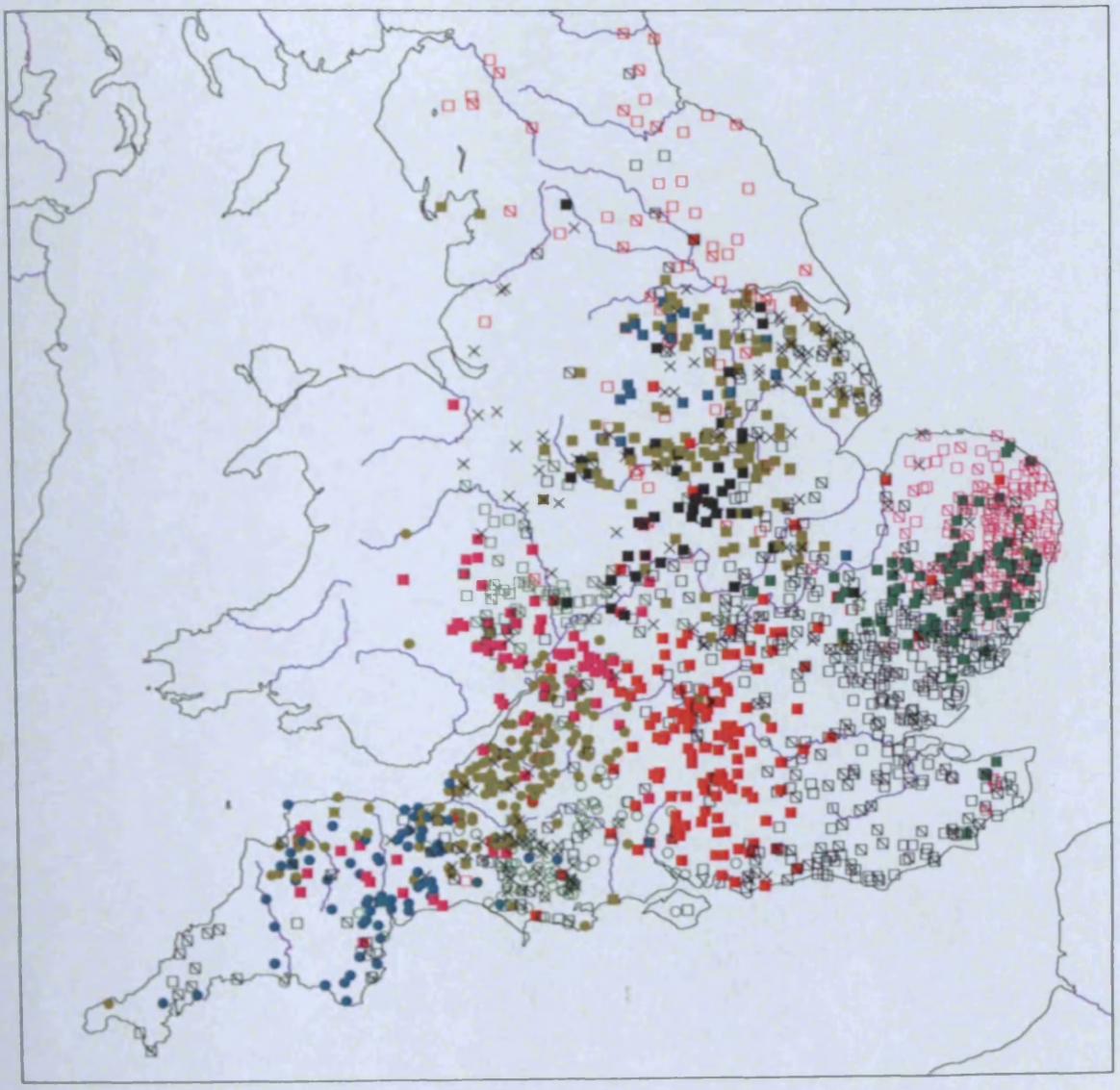


Figure 229: map showing the distribution of bells allocated to a place of manufacture by the correspondence analysis of units and the documentary evidence (x local and itinerant founders; • Bristol; ■ Bury St Edmunds; ■ Chesterfield; • Exeter; ■ Gloucester; ■ Leicester; □ London; □ Norwich; ■ Nottingham; ■ Reading/Wokingham; o Salisbury; □ Worcester; □ York)



APPENDIX 1
MARKS ON PRE-REFORMATION BELLS FROM ENGLAND

This catalogue of bell marks relates to the stamps (types) in the incidence matrix used in this study (Appendix 3). The numbering used is essentially arbitrary. Although some reference is made to the function of a mark in the inscription, for example 1.* are initial crosses, 8.* capital lettering sets, this is not rigorous as the same stamp can be used in different positions. It has proven useful approach, however, in identifying particular marks quickly.

Almost all the illustrations have been reproduced from published sources. For the first time, all the published references to each mark have been cross-referenced. These cross references are listed below. So, for example, Cross 1.0001 is Figure 10 in *The Church Bells of Bedfordshire* (North 1883), and also the cross on p52 of *The Church Bells of Norfolk* (L'Estrange 1874).

Inevitably, especially when relying on published material, there will be mistakes—either because marks were recorded erroneously by previous workers, or because I have crossed referenced their figures incorrectly. The general policy, however, has been to keep stamps separate when the sources are doubtful or contradictory. This is probably most applicable to the lettering sets (5.* and 8.*) which are generally less well recorded and illustrated than the foundry marks. There is also confusion over marks which appear in different sizes (eg 3.0092 and 3.0093) as very few of the published illustrations have any indication of scale and it may not be apparent which size of stamp appears on a particular bell. Where possible marks which occur in different sizes have been distinguished, although generally the illustrations included here are not to scale. Some stamps have also been identified by reference to "type" sites, for example 5.0032 is known as the "Chiltington minuscules". These names have also been cross-referenced as they appear frequently in the literature.

Most of the publications in which bell marks have been illustrated have been identified by reference to the county or author concerned. These identifications are as follows:

Beds	North 1883
Bell *et al* 1987	Bell *et al* 1987
Berks	Sharpe 1970
Bucks	Cocks 1897
Cambs	Raven 1869
CambsB	Raven 1882
Cardigan	Sharpe 1965
Cattermole	Cattermole 1990
Cheshire	Clarke 1948; 1950; 1952; 1955
Chitty	Chitty 1920
Cockey	Cockey 1911
Cornwall	Dunkin 1878
Cumb	Whitehead 1883; 1884; 1886a-b; 1888; 1891a-b; 1895a-b; 1897a-b
DerbyA	Jewitt 1872a-d; 1873a-c; 1874; 1875a-b; 1876; 1877; 1878a-b; 1879
DerbyB	Halls and Dawson 1998; 1999; 2000
Devon	Ellacombe 1867; 1872
Dorset	Raven 1906a
Draper	Draper 1951
Durham	Blair 1887; 1889a-t; 1891a-j; 1893a-e
Eisel	Eisel 1977
Ellacombe	Ellacombe 1881
Ellacombe 1875	Ellacombe 1875
Elphick	Elphick 1960
Essex	Deedes and Walters 1909
Fowler 1865	Fowler 1865
Fowler 1869	Fowler 1869
Gaythorpe	Gaythorpe 1902
Glouces	Bliss and Sharpe 1986
Greenwood	Greenwood 1995
Hants	Colchester 1920
Hawkins	Hawkins 1938
Here	Sharpe 1976
HertsA	North 1886
HertsB	Dodds 1994
Holmes	Holmes 1980
Holmes 1987	Holmes 1987

Holmes 1989	Holmes 1989
Hunts	Owen 1899
Kent	Stahlschmidt 1887
Lancs	Cheetham 1914; 1915; 1916; 1919; 1921; 1922; 1928
Leics	North 1876
Lincs	North 1882
Lukis	Lukis 1857
Norfolk	L'Estrange 1874
Northants	North 1878
NottsA	Stiff 1872; 1878a-b; 1879
NottsB	Wilkinson 1929; 1931
NottsC	Dawson 1994; 1995a-b
Oxon	Sharpe 1953
Pipe	Clouston and Pipe 1980
Poppleton	Poppleton 1902; 1903a-c; 1905
Raven 1897	Raven 1897
Raven 1902	Raven 1902
RCHM York	RCHM 1972
Richards	Richards and Oakley 1966
Rutland	North 1880
Salop	Walters 1915
Sheffield	Dawson 1998
Somerset	Ellacombe 1875
Staffs	Lynam 1889
Suffolk	Raven 1890
Surrey	Stahlschmidt 1884
Sussex	Elphick 1970
Thurlow	Thurlow 1947
Tyssen 1908	Tyssen 1908
Tyssen 1922	Tyssen 1922
TyssenA	Tyssen 1864
TyssenB	Tyssen 1915
VCH (Berks)	Ditchfield and Page 1906, 412-22
Walters 1893	Walters 1893
Walters 1897	Walters 1897
Walters 1906a	Walters 1906a
Walters 1906b	Walters 1906b
Walters 1908	Walters 1908
Walters 1912	Walters 1912
Walters 1918	Walters 1918
Walters 1926a	Walters 1926a
Walters 1926b	Walters 1926b
Warks	Tilley and Walters 1910
Wilts	Walters 1929
Witts	Witts 1882
Worcs	Walters 1932

Of the 1125 stamps identified in this appendix, 41 stamps are not illustrated here. This is either because the mark genuinely has never been illustrated, but may be because it is unclear from the publications which stamp is meant by a particular description. For example, the Barleston capitals (8.0250), may well be an alternative description for one of the sets of lettering which appear with the cross found on this group of bells (1.0129)—8.0094 or 8.0139—but this cannot be confirmed without fieldwork. In these cases the figure number is given with a blank space where the illustration would be.

The vast majority of the figures have been reproduced from publications where copyright has expired. I am grateful, however, to Dr Paul Cattermole for permission to reproduce crosses 1.0287-9, minuscule sets 5.0080-1, medallion 7.0094, and capital sets 8.0243 and 8.0245-7 from Cattermole (1990), and medallion 7.0095 from Cattermole (1992). Dr Eric Clouston and Ms Katherine S P Clouston kindly provided permission to reproduce illustrations of medallions 7.0098-9 and 7.0104-5, and capital set 8.0258 produced by their father, the late Mr Ranald Clouston (Clouston and Pipe 1980). Dr Christopher Dalton has kindly allowed me to reproduce his photograph of the shield appearing on a bell at Sapperton, Gloucestershire (3.0035). Mr George Dawson has kindly allowed me to reproduce his illustrations of crosses 1.0245, 1.0181, and 1.0294-8, stops 2.0070, 2.0124, and 2.0167-8, fleur-de-lys 6.0025-8, and medallion 7.0108 (from Dawson 1994); stop 2.0170, fleur-de-lys 6.0030, and capital set 8.0265 (from Dawson 1995b); cross 1.0299, stop 2.0169, shield 3.0106, and fleur-de-lys 6.0029 (from Dawson 1998); crosses 1.0174, 1.0300, and 1.0304-5, stops 2.0111 and 2.0179, shield 3.0101, medallion 7.0110, and capital sets 8.0030, 8.0180, and 8.0251 (from Halls and Dawson 1998); and cross 1.0309, stop 2.0179, minuscule set 5.0097, and capital sets 8.0058 and 8.0180 (from Halls and Dawson 2000). Mr Geoffrey Dodds and Mrs Joyce Dodds gave permission for the reproduction of drawings of crosses 1.0301-2, stops 2.0171-2, and shield 3.0102 (Dodds 1994). Dennis Greenwood has kindly provided permission for the reproduction of cross 1.0303, shield 3.0103, minuscule set 5.0094, and fleur-de-lys 6.0032-3 from Greenwood (1995).The illustration of minuscule set 5.0001 is reproduced by permission of *The Architectural Review*, and illustrations of cross 1.0310 and capital set 8.0214 are reproduced by permission of the Society of Medieval Archaeology. Shield 3.0045 and

3,0048-9, and medallions 7.0036 and 7.0069 are ©Crown copyright. NMR, and are reproduced with permission of English Heritage.

The illustrations of crosses 1.0070, 1.0091, and 1.0190, stops 2.0046, 2.0069, 2.0086, 2.0100, 2.0102, 2.0127, and 2.0162, shield 3.0071, crown 4.0005, minuscule sets 5.0055-6, medallions 7.0057 and 7.0090-1, and capital set 8.0196 are by the late Mr George Elphick (Elphick 1970) and are reproduced by kind permission of Phillimore & Co. Ltd, Shopwyke Manor Barn, Chichester, West Sussex, England, PO20 2BG. Cross 1.0155 and capital set 8.0260 are also by Mr Elphick (Elphick 1960), and are reproduced by kind permission of his daughter, Mrs Janet Macey. Capital sets 8.0120, 8.0140, and 8.0181 have been reproduced from the *Church Bells of Nottinghamshire* by the late Rev R F Wilkinson, and are reproduced by kind permission of the Thoroton Society. Cross 1.0292, shield 3.0099, and capital set 8.0262 have been reproduced from the *Church Bells of England* by the late H B Walters by permission of Oxford University Press. The Lancashire and Cheshire Antiquarian Society have kindly given permission for the reproduction of medallion 7.0078 (Clarke 1955), cross 1.0218, stop 2.0058, and capital set 8.0093 (Cheetham 1914), crosses 1.0086 and 1.0262, crown 4.0004, minuscule set 5.0072, and capital set 8.0178 (Cheetham 1915), crosses 1.0217, 1.0162, and 1.0276, stops 2.0057 and 2.0059, crown 4.0003, minuscule set 5.0022, fleur-de-lys 6.0016, and capital sets 8.0136-7 (Cheetham 1916), minuscule set 5.0075 (Cheetham 1919), crosses 1.0263-4, stops 2.0051 and 2.0103, and minuscules 5.0020 (Cheetham 1921), and crosses 1.0215-6 and 1.0275, stops 2.0052 and 2.0054-6, shield 3.0046, minuscule set 5.0021, and capital sets 8.0115, 8.0176, 8.0179, and 8.0220 (Cheetham 1922).

The Sharpe Trust have also kindly allowed me to reproduce the following figures from works by the late Mr Frederick Sharpe: crosses 1.0040, 1.0099-100, 1.0104, and 1.0279, stop 2.0005, minuscule set 5.0004, and capital sets 8.0003, 8.0018, 8.0040-1, 8.0045, 8.0047, 8.0054, and 8.0057 (from Sharpe 1970); crosses 1.0016, 1.0134, 1.0138-9, and 1.0142, stops 2.0009, 2.0061, and 2.0147, crown 4.0007, medallion 7.0045, and capital sets 8.0036, 8.0063, 8.0069, and 8.0091 (from Sharpe 1976); and crosses 1.0211, 1.0223, and 1.0229, stops 2.0121, 2.0155, shield 3.0096, and capital sets 8.0032, 8.0158, 8.0217, and 8.0241 (from Sharpe 1953). The Sharpe Trust and Miss Mary Bliss have also kindly allowed me to reproduce stops 2.0010-11, 2.0022, and 2.0024 and capital sets 8.0043, 8.0084, 8.0107, and 8.0110 (Bliss and Sharpe 1986).

I have been unable to locate the descendants of the late H B Walters FSA (1869 – 1944), although crosses 1.0204 and 1.0205, stop 2.0104, minuscule set 5.0017, and capital set 8.0009 are reproduced by kind permission of the Ecclesiological Society. The illustrations of crosses 1.0019, 1.0082, 1.0197, 1.0207, 1.0236-7, 1.0240, 1.0260, and 1.0225, stops 2.0090-1 and 2.0149, shield 3.0077, minuscule sets 5.0057-8, medallions 7.0089 and 7.0092, and capital sets 8.0119, 8.0139, 8.0150, 8.0156, 8.0173, 8.0182, and 8.0202 are reproduced with permission of the Shropshire Archaeological and Historical Society; and the illustrations of crosses 1.0054, 1.0060, 1.0081, 1.0130, 1.0154, 1.0157, and 1.0219, stops 2.0019, 2.0025-6, 2.0074, and 2.0143, minuscule sets 5.0007 and 5.0070, fleur-de-lys 6.0012, medallion 7.0049, and capital sets 8.0028, 8.0068, 8.0070, 8.0072-3, 8.0077-8, 8.0081, and 8.0089-90 are reproduced with permission of the Worcestershire Archaeological Society. The Bristol and Gloucestershire Archaeological Society have provided permission to reproduce stops 2.0013 and 2.0145, medallion 7.0075, and capital sets 8.0102-3.

The following illustrations have been reproduced from *The Church Bells of Essex: their founders, inscriptions, traditions and uses*, by the late H B Walters and the late Rev Cecil Deedes (1843 – 1929): crosses 1.0017-18, 1.0052-3, and 1.0306, stops 2.0036, 2.0138-9, 2.0141, and 2.0173, minuscule set 5.0005, medallions 7.0021 and 7.0029, and capital sets

8.0007, 8.0025, 8.0034, 8.0060, 8.0083, 8.0086, 8.0092, and 8.0155. This volume was privately printed for the authors in 1909. Crosses 1.0062, 1.0088, 1.0220, 1.0224, and 1.0243, stops 2.0016, 2.0018, and 2.0150-1, minuscule sets 5.0059, 5.0061-2, and 5.0071, medallion 7.0088, and capital sets 8.0061-2, 8.0064, 8.0075, 8.0082, 8.0085, 8.0118, 8.0131, 8.0172, 8.0200, and 8.0238 have been reproduced from the *The Church Bells of Warwickshire, their founders, traditions, inscriptions and uses*, by the late H B Walters and the late Rev H T Tilley (1854-1905). This volume was printed privately for H B Walters in 1910. There was a Kingsmead Reprint in 1969, although this firm also no longer exists and has been unable to help with tracing Walters' copyright holders. Finally, crosses 1.0020, 1.0066, 1.0075, 1.0080, 1.0170, 1.0178, 1.0252, and 1.0290, stops 2.0071, 2.0097, 2.0109-10, 2.0112, 2.0118, crowns 4.0008 and 4.0010, minuscule sets 5.0024-6, 5.0035, 5.0044, 5.0049, 5.0064-5, and 5.0082, medallions 7.0039, 7.0043, 7.0054, and 7.0056, and capital sets 8.0014, 8.0028-9, 8.0129, 8.0141, 8.0166, 8.0195, 8.0199, 8.0201, 8.0223, 8.0225-6, 8.0228, 8.0231, 8.0234, and 8.0236 have been reproduced from *The Church Bells of Wiltshire: their inscriptions and history* by the late H B Walters. This volume was issued by the Wiltshire Archaeological Society, although copyright remained with the author.

I have been unable to determine when J Eyre Poppleton died (publishing 1902-6), although crosses 1.0069, 1.0195-6, 1.0210, 1.0278, and 1.0291, stops 2.0040, 2.0048, and 2.0126, shields 3.0023, 3.0028, 3.0052-6, 3.0076, and 3.0098, minuscule sets 5.0018 and 5.0076-8, fleurs-de-lys 6.0003 and 6.0024, medallions 7.0033-4, 7.0038, and 7.0067-8, and capital sets 8.0006, 8.0022, 8.0172, 8.0183-4, 8.0192, and 8.0264 are reproduced with permission of the Yorkshire Archaeological Society.

Crosses 1.0307-8, stops 2.0174-7, shields 3.0104-5, minuscule sets 5.0095-6, medallion 7.0109, and capital sets 8.0268-72 are reproduced from *Notes taken from a collection of Inscriptions on Ancient and Interesting Suffolk Church Bells* by C H Hawkins (1938). I have been unable to ascertain when the author died, or who holds copyright on this material. I have also been unable to trace the decendents of Canon Gilbert Thurlow (1909-99). Capital set 8.0244 is reproduced from Thurlow (1947).

Grateful thanks are given to all those individuals and organisations who have given permission for the reproduction of this material, and apologies to those whom I have been unable to trace.

Crosses

1.0001 Cross at p52 Norfolk
1.0001 Fig 10 Beds
1.0001 Fig 13 Witts
1.0001 Fig 14 Cambs
1.0001 Fig 17 Leics
1.0001 Fig 187 Surrey
1.0001 Fig 18 Northants
1.0001 Fig 20 Somerset
1.0001 Fig 21a Oxon
1.0001 Fig 22 Suffolk
1.0001 Fig 23 Cornwall
1.0001 Fig 23 TyssenA
1.0001 Fig 23 TyssenB
1.0001 Fig 24 HertsB
1.0001 Fig 25 Bucks
1.0001 Fig 26 Kent
1.0001 Fig 27 Hunts
1.0001 Fig 28 HertsA
1.0001 Fig 28 Lincs
1.0001 Fig 36 CambsB
1.0001 Fig 45 Devon
1.0001 Fig 4 Raven 1897
1.0001 Fig 52 Berks
1.0001 Fig 62 Poppleton
1.0001 Fig 62 at p514 Devon
1.0001 Fig 69 Ellacombe at p21
1.0001 Fig 6 Dorset
1.0001 Fig 78b Dorset
1.0001 Fig 87 Ellacombe
1.0001 Fig C2 Oxon
1.0001 Ihu Mercy Cross
1.0001 Plate XI, 16 Warks
1.0001 Plate XII, 5 Essex
1.0001 Plate XV, c Sussex

1.0002 Fig 11 Kent
1.0002 Fig 12 Hunts
1.0002 Fig 12 Suffolk

1.0002 Fig 14 Lincs
1.0002 Fig 15 Devon
1.0002 Fig 19 TyssenA
1.0002 Fig 26 CambsB
1.0002 Fig 34d Oxon
1.0002 Fig 39 Northants
1.0002 Fig 45 Berks
1.0002 Fig 4 Ellacombe 1875
1.0002 Fig 8 Cambs
1.0002 Fig S8 Oxon
1.0002 Plate X, 3 Essex
1.0002 Plate XI, d Sussex
1.0002 Plate XII, d Warks

1.0003 Cross Fig 223 Worcs
1.0003 Fig 223 Worcs
1.0003 Fig 229a Worcs
1.0003 Fig 26 Bucks
1.0003 Fig 27 Somerset
1.0003 Fig 38 CambsB
1.0003 Fig 95d Wilts
1.0003 Illus at p14 Ca CambsB
1.0003 Illus at p297 Walters 1912

1.0004 Fig 11 Bucks
1.0004 Fig 168 Surrey
1.0004 Fig 20 Kent
1.0004 Fig 24 Suffolk
1.0004 Fig 32 Rutland
1.0004 Fig 56 Northants
1.0004 Fig 68 Ellacombe
1.0004 Fig Db Gloucs
1.0004 Fig V4 Oxon

1.0005 Cross 1.10 Cattermole
1.0005 Cross 1 at p32 Lancs Lower
1.0005 Cross at p32 Lancs Upper
1.0005 Fig 119 Northants
1.0005 Fig 16 HertsB
1.0005 Fig 17 Bucks
1.0005 Fig 22 Hunts
1.0005 Fig 26a Worcs
1.0005 Fig 30 Suffolk
1.0005 Fig 30 TyssenB
1.0005 Fig 37a Worcs
1.0005 Fig 42 Berks
1.0005 Fig 65 Poppleton
1.0005 Fig 6 Beds
1.0005 Fig 74d Berks
1.0005 Plate XII, 9 Essex
1.0005 Plate XV, a Sussex

1.0006 Fig 14 Kent
1.0006 Fig 15 Cornwall
1.0006 Fig 184 Surrey
1.0006 Fig 19 HertsA
1.0006 Fig 1 Fowler 1865
1.0006 Fig 1 at p195 Durham
1.0006 Plate XIII, 1 Warks

1.0007 Cross at p57 Norfolk
1.0007 Fig 12b HertsB
1.0007 Fig 15 Lincs
1.0007 Fig 16 Somerset
1.0007 Fig 35 Greenwood
1.0007 Fig 3 Beds
1.0007 Fig 41 Devon
1.0007 Fig 44c Dorset
1.0007 Fig 50 Northants
1.0007 Fig 5 Bucks
1.0007 Fig 89 Suffolk
1.0007 Fig 96b Dorset
1.0007 Plate X, 2 Essex
1.0007 Plate XI, 3 Warks

1.0008 Cross at p11 Eisel
1.0008 Fig 10 Kent
1.0008 Fig 11 Cornwall
1.0008 Fig 12 Lincs
1.0008 Fig 13 Hunts
1.0008 Fig 13 Suffolk
1.0008 Fig 16 Devon
1.0008 Fig 25 CambsB
1.0008 Fig 47e Wilts
1.0008 Fig 5 Ellacombe 1875
1.0008 Fig S11 Oxon
1.0008 Plate XI, 5 Lukis

1.0009 Fig 142 DerbyA
1.0009 Fig 15 Somerset
1.0009 Fig 42 Suffolk
1.0009 Fig 5a Kent
1.0009 Plate IV, 13 Essex

1.0010 Cross at p57 Norfolk
1.0010 Fig 17 Lincs
1.0010 Fig 18 Somerset
1.0010 Fig 23 Kent Octagonal Ground
1.0010 Fig 43 Devon
1.0010 Fig 44a Dorset
1.0010 Fig 5 Cornwall
1.0010 Fig 60 Northants
1.0010 Plate X, c Sussex

1.0011 Fig 10 Cornwall
1.0011 Fig 13 Cambs
1.0011 Fig 16 Lincs
1.0011 Fig 18 Suffolk
1.0011 Fig 1 at p50 Norfolk
1.0011 Fig 20 TyssenA
1.0011 Fig 20 TyssenB
1.0011 Fig 33 CambsB
1.0011 Plate X, 1 Essex
1.0011 Plate XI, e1 Sussex
1.0011 Plate XIII, 14 Warks

1.0012 Cross Plate X Bucks
1.0012 Fig 12a HertsB
1.0012 Fig 26 Ellacombe at p16
1.0012 Fig 27 Ellacombe at Plate II
1.0012 Fig 34 HertsA
1.0012 Fig 6 Bucks
1.0012 Fig 91 Suffolk

1.0013 Fig 170a Wilts
1.0013 Fig 171a Wilts
1.0013 Fig 187 Wilts
1.0013 Fig 18 Devon
1.0013 Fig 25 Ellacombe
1.0013 Fig 25 Walters 1893
1.0013 Fig 30 Somerset
1.0013 Fig 4a Walters 1918
1.0013 Fig 52 Glouc s
1.0013 Fig 52 Here
1.0013 Fig 67a Wilts
1.0013 Fig 78c Wilts
1.0013 Fig 9 Witts

1.0014 Fig 187 Wilts Small Size
1.0014 Fig 25 Ellacombe Small Size
1.0014 Fig 25 Walters 1893 Small

1.0015 Fig 101c Wilts
1.0015 Fig 14a Dorset
1.0015 Fig 16a Dorset
1.0015 Fig 179a Wilts
1.0015 Fig 185 Wilts
1.0015 Fig 2 Dorset
1.0015 Fig 41a Wilts
1.0015 Fig 71a Dorset
1.0015 Fig 92a Wilts
1.0015 Fig 63 Somerset

1.0016 Fig 128a Here

1.0017 Plate I, 9 Essex

1.0018 Plate XVIII, 12 Essex
1.0018 Radwinter Cross
1.0018 Plate XVII, 13 Hawkins 1938
1.0018 Plate XXIV, d & i Hawkins 1938

1.0019 Plate X, 3 Salop

1.0020 Fig 29a Wilts

1.0021 Fig 54 Lincs
1.0021 Plate Va Hawkins 1938

1.0022 Fig 28 Hunts

1.0023 Fig 16 Hunts

1.0024 Polygonal Cross at p23 Norfolk
1.0024 Plate XXXII, 7 Essex

1.0025 Fig 82 Dorset

1.0026 Fig 32a Dorset

1.0027 Fig 62 Somerset

1.0028 Fig 22 NottsC
1.0028 Fig 68 Leics

1.0029 Fig 170 Surrey
1.0029 Fig 21 Kent
1.0029 Fig 35c Hants
1.0029 Plate VI, 7 Essex

1.0030 Fig 28 Devon

1.0031 Fig 33 Devon
1.0031 Tor Mohun Cross

1.0032 Fig 95a Dorset

1.0033 Chippenham Cross
1.0033 Cross at p55 Norfolk
1.0033 Cross Plate IV Bucks Lower
1.0033 Cross Plate X Surrey
1.0033 Fig 10a Worcs
1.0033 Fig 110 Sheffield
1.0033 Fig 115a Worcs
1.0033 Fig 134a Worcs
1.0033 Fig 135 Lincs
1.0033 Fig 156a Worcs
1.0033 Fig 157a Worcs
1.0033 Fig 196a Worcs
1.0033 Fig 239a Worcs
1.0033 Fig 24b Cambs
1.0033 Fig 24 Leics
1.0033 Fig 25 Glouc s
1.0033 Fig 25 Here
1.0033 Fig 29 Beds
1.0033 Fig 35a TyssenB
1.0033 Fig 3a Worcs
1.0033 Fig 42 DerbyA
1.0033 Fig 4 HertsA
1.0033 Fig 4 HertsB
1.0033 Fig 6 Hunts
1.0033 Fig 7a Worcs
1.0033 Fig 7 Suffolk
1.0033 Fig 8 CambsB
1.0033 Fig 98a Wilts
1.0033 Fig Ca Glouc s
1.0033 Fig E5 Oxon
1.0033 Plate I, 1Walters 1906a
1.0033 Plate III, 13 Essex
1.0033 Plate III, 2 Salop
1.0033 Plate IX, 1 Salop
1.0033 Plate V, 12 Warks
1.0033 Plate VI, a Sussex
1.0033 Plate XXVIIIa Hawkins 1938

1.0034 Fig 191 Surrey
1.0034 Fig 1 Kent
1.0034 Fig 22 HertsA
1.0034 Fig 22 HertsB
1.0034 Fig 25 Beds
1.0034 Fig 36 Greenwood
1.0034 Fig 37 Suffolk
1.0034 Fig 51 Ellacombe
1.0034 Fig 51 Walters 1893
1.0034 Fig 59 Lincs
1.0034 Fig 8 Bucks
1.0034 Plate 133, 12 Staffs
1.0034 Plate 21, d Staffs

1.0034 Plate VII, 6 Essex
1.0034 Plate XI, 2 Warks
1.0034 Plate XI, 8 Bucks

1.0035 Fig 105 Northants
1.0035 Fig 112 NottsC
1.0035 Fig 13 Somerset
1.0035 Fig 148a Wilts
1.0035 Fig 15 Beds
1.0035 Fig 16 Northants
1.0035 Fig 1 Rutland
1.0035 Fig 21 Bucks
1.0035 Fig 31 Lincs
1.0035 Fig 38a Hants
1.0035 Fig 38 Devon
1.0035 Fig 65 Sheffield
1.0035 Fig 6 Hants
1.0035 Fig 6 Holmes
1.0035 Plate I, 1 Salop

1.0036 Fig 199 Surrey
1.0036 Fig 23 Kent
1.0036 Fig 29b HertsB
1.0036 Fig 33a Hants
1.0036 Fig 34a Hants
1.0036 Fig 36 Suffolk
1.0036 Fig 4 Beds
1.0036 Fig 50 Ellacombe
1.0036 Fig 50 Walters 1893
1.0036 Fig 7 Bucks
1.0036 Fig M3 Oxon
1.0036 Fig Q11 Oxon
1.0036 Plate 133, 11 Staffs
1.0036 Plate 20d Staffs
1.0036 Plate VII, 5 Essex

1.0037 Fig 23 Kent Small Size
1.0037 Plate VII, 5 Essex Smaller

1.0038 Cross Plate XII Surrey
1.0038 Fig 101b Berks
1.0038 Fig 10 Hants
1.0038 Fig 12 HertsA
1.0038 Fig 22 Beds
1.0038 Fig 26 Somerset
1.0038 Fig 3 Berks
1.0038 Fig 44 Suffolk
1.0038 Fig 47 Northants
1.0038 Fig 59 CambsB
1.0038 Fig 5 Hunts
1.0038 Fig 5 TyssenA
1.0038 Fig 5 TyssenB
1.0038 Fig 7 Holmes 1989
1.0038 Fig F6 Oxon
1.0038 Plate IIf Holmes 1989
1.0038 Plate XIII, d Sussex

1.0039 Chertsey Cross
1.0039 Cross Plate XV Bucks
1.0039 Fig 13c HertsB
1.0039 Fig 16a Oxon
1.0039 Fig 2 VCH (Berks)
1.0039 Fig 3 Hants
1.0039 Fig 4 Berks
1.0039 Fig 56a Dorset
1.0039 Fig 5 Holmes 1987
1.0039 Fig 5 Walters 1897
1.0039 Fig 63f Berks
1.0039 Fig 64a Berks
1.0039 Fig F4 Oxon
1.0039 Fig Fa Berks
1.0039 Plate 2d Richards
1.0039 Plate 56 Gloucs
1.0039 Plate at p48 Holmes 1987 (A)
1.0039 Plate at p51 Holmes 1987 (E)
1.0039 Plate III Berks Lower, b
1.0039 Plate XII, 5 Surrey
1.0039 Plate XIII, b Sussex
1.0039 Plate XVI Bucks Crowned Cross

1.0040 Fig 96b Berks

1.0041 Plate XI, 5 Bucks
1.0041 Plate XII, 5 Bucks

1.0042 Fig 7 HertsA
1.0042 Fig 7 HertsB
1.0042 Fig 80a Berks
1.0042 Fig 84 Berks
1.0042 Fig A at p310 Draper
1.0042 Plate XII, c1 Sussex

1.0043 Fig 27 Beds

1.0044 Crowned Cross Plate X Bucks
1.0044 Fig 74a Wilts
1.0044 Fig C Plate at p27 Pipe

1.0045 Illus at p14 Ba CambsB

1.0046 Illus at p14 Aa CambsB

1.0047 Fig 16 Witts
1.0047 Fig 57 Ellacombe
1.0047 Fig 57 Walters 1893

1.0048 Fig 9 Ellacombe

1.0049 Fig 11 at p493 Cumb

1.0050 Fig 10 at p493 Cumb

1.0051 Fig 110 NottsC
1.0051 Fig 45 DerbyA
1.0051 Fig 45 DerbyB
1.0051 Fig 4 at p489 Cumb
1.0051 Fig 55 Poppleton
1.0051 Fig 60 Leics
1.0051 Fig 64 Lincs
1.0051 Plate XIIIa Poppleton

1.0052 Plate XVIII, 8 Essex
1.0052 Plate XVII, 11 & 15 Hawkins 1938
1.0052 Plate XXIII, e & l Hawkins 1938

1.0053 Plate XIII, 2 Essex

1.0054 Fig 232a Worcs
1.0054 Worcester St Andrew Cross

1.0055 Fig B at p292 DerbyB
1.0055 Fig 10 Poppleton
1.0055 Fig 10 Sheffield
1.0055 Fig 18 Greenwood
1.0055 Fig 26 DerbyA
1.0055 Fig 26 DerbyB
1.0055 Fig 83 Lincs
1.0055 Fig 86 NottsC

1.0056 Cross Bottom p253 Devon
1.0056 Fig 111 Lincs
1.0056 Fig 25 Leics
1.0056 Fig 5 Witts
1.0056 Fig 60 Ellacombe
1.0056 Fig 62 Northants
1.0056 Fig 7 CambsB
1.0056 Stoneleigh Cross
1.0056 Fig 60 Walters 1893

1.0057 Fig 25 Lincs

1.0058 Fig 120 Lincs

1.0059 Fig 134 Lincs
1.0059 Fig 14 NottsC

1.0060 Fig 1a Worcs
1.0060 Fig 2a Worcs

1.0061 Fig 121 Lincs

1.0062 Plate II, 10 Warks

1.0063 Fig 117 Lincs
1.0063 Fig 44 NottsA
1.0063 Fig 44 NottsC
1.0063 Fig 99 Sheffield

1.0064 Fig 101a Worcs
1.0064 Fig 104 Worcs
1.0064 Fig 131d Worcs
1.0064 Fig 220f Worcs
1.0064 Fig 238a Worcs
1.0064 Fig 4 Walters 1897
1.0064 Fig 65 Devon
1.0064 Plate II, 2 Walters 1906a
1.0064 Plate XXI, 1 Salop
1.0064 Fig 171a Worcs

1.0065 Chitterne Cross
1.0065 Fig 43a Dorset
1.0065 Fig 66 Somerset
1.0065 Fig 99 Ellacombe
1.0065 Plate 133, 9 Staffs
1.0065 Plate 18, a Staffs
1.0065 Plate 19, a Staffs
1.0065 Fig 93 Ellacombe at p22
1.0065 Plate at p366a Tyssen 1908
1.0065 Plate II, 1 Walters 1906a

1.0066 Fig 102a Wilts
1.0066 Fig 106a Wilts
1.0066 Fig V11 Oxon

1.0067 Fig 180a Worcs
1.0067 Fig 20 Glouc s
1.0067 Fig 20 Here
1.0067 Fig 40 Ellacombe
1.0067 Fig 40 Walters 1893
1.0067 Fig 6 Witts
1.0067 Fig 94a Wilts
1.0067 Lower Slaughter Cross
1.0067 Plate 39b Glouc s
1.0067 Plate IIa Salop
1.0067 Plate V, 1 Warks

1.0068 Fig 126 DerbyB
1.0068 Fig 3 Leics

1.0069 Fig 103 Sheffield
1.0069 Plate XIIa Poppleton

1.0070 Plate XV, e Sussex

1.0071 Cross 1.6 Cattermole
1.0071 Cross 1 at p32 Norfolk
1.0071 Fig 49 Suffolk
1.0071 Plate XXVf Hawkins 1938

1.0072 Fig 20 Leics

1.0073 Fig 29a Dorset
1.0073 Fig 39a Dorset
1.0073 Fig 52b Wilts
1.0073 Fig 61a Dorset
1.0073 Fig 66a Dorset

1.0074 Fig 41 Leics

1.0075 Fig 53a Wilts

1.0076 Fig 52c Dorset

1.0077 Fig 11a Dorset
1.0077 Fig 12a Dorset

1.0078 Fig 91a Dorset

1.0079 Cross 1.7 Cattermole
1.0079 Cross 3 at p32 Norfolk

1.0080 Fig 174c Wilts

1.0081 Fig 121a Worcs
1.0081 Fig 124a Worcs
1.0081 Plate XI, d Sussex
1.0081 Sturdy Cross

1.0082 Plate XX, 8 Salop

1.0083 Cross Plate II Kent
1.0083 Cross Plate VIII Surrey
1.0083 Fig 160 Surrey
1.0083 Fig 1a Hants
1.0083 Fig 1 Holmes 1987
1.0083 Fig 226a Worcs
1.0083 Fig 5 Bucks in Square Crowned
1.0083 Plate at p45 Holmes 1987 (A)
1.0083 Plate VII, 3 Essex
1.0083 Stephen Norton's Initial Cross

1.0084 Fig 23a Dorset
1.0084 Plate VII, 4 Essex

1.0085 Cross 7 at p51 Norfolk
1.0085 Dawe Cross
1.0085 Fig 14 TyssenA
1.0085 Fig 14 TyssenB
1.0085 Fig 15 Suffolk
1.0085 Fig 18 HertsA
1.0085 Fig 9 Hunts
1.0085 Fig 9 Kent
1.0085 Fig A Plate at p27 Pipe
1.0085 Fig N10 Oxon
1.0085 Plate IX, 12 Essex
1.0085 Plate I Row 3c Thurlow
1.0085 Plate VIII, 6 Essex
1.0085 Plate XI, b Sussex

1.0086 Cross at p20 Lancs Lower

1.0087 Cross at p193 Durham

1.0088 Plate II, 9 Warks

1.0089 Cross at p15 Essex
1.0089 Fig 34c Hants
1.0089 Fig 41 Suffolk
1.0089 Fig 8 Cornwall
1.0089 Fig C12 Oxon
1.0089 Plate IX, e Sussex
1.0089 Plate VI, 5 Essex
1.0089 Plate VII, 1 Essex
1.0089 Plate XI, 1 Bucks

1.0090 Fig 138a Worcs
1.0090 Fig 14a Worcs
1.0090 Fig 170a Worcs
1.0090 Fig 199a Worcs
1.0090 Fig 200a Worcs
1.0090 Fig 218a Worcs
1.0090 Fig 23a Hants
1.0090 Fig 43a Wilts
1.0090 Fig 4a Worcs
1.0090 Fig 7 Here
1.0090 Fig 81a Dorset
1.0090 Fig 83a Worcs
1.0090 Fig 84a Worcs
1.0090 John Barber's Cross
1.0090 Plate I, 4 Salop
1.0090 Fig 201a Worcs

1.0091 Doddinghurst Cross
1.0091 Fig 7a Walters 1906b
1.0091 Plate XVII, d Sussex

1.0092 Fig 15 at p131 Cumb

1.0093 Fig 70 Ellacombe
1.0093 Fig 9a Oxon
1.0093 Plate 126a Glouces

1.0094 Fig 22a Dorset

1.0095 Fig 36 Somerset

1.0096 Fig 3 Cornwall
1.0096 Fig 3 Devon
1.0096 Fig 3 Somerset
1.0096 Fig 3 Witts
1.0096 Fig 48a Hants
1.0096 Fig 48a Wilts
1.0096 Fig 49a Wilts
1.0096 Fig 4 Glouces
1.0096 Fig 62 Ellacombe
1.0096 Fig G10 Oxon
1.0096 Norton's Cross

1.0097 Fig 26 Ellacombe at Plate II
1.0097 Fig 27 Ellacombe at p16
1.0097 Fig 28 Somerset
1.0097 Fig 7 Witts

1.0098 Fig 21 Devon
1.0098 Fig 2a Walters 1918
1.0098 Fig 32 Somerset
1.0098 Fig 47a Dorset
1.0098 Fig 62 Cardigan
1.0098 Fig 62 Here

1.0099 Fig 39a Hants
1.0099 Fig 95 Berks
1.0099 Fig 97a Berks

1.0100 Fig 40a Hants
1.0100 Fig 97c Berks

1.0101 Enborne Cross
1.0101 Fig 118a Here
1.0101 Fig 36b TyssenB
1.0101 Fig 60 Berks
1.0101 Fig 63 Ellacombe
1.0101 Fig 69a Berks
1.0101 Plate III, a1 Sussex
1.0101 Plate VIIa Salop
1.0101 Recercle Cross

1.0102 Fig 40 Suffolk
1.0102 Plate IV, 9 Essex
1.0102 Plate XI, 3 Bucks

1.0103 Plate IX, c Sussex

1.0103 Plate VII, 7c Essex
1.0103 Plate XI, 2 Bucks Octag Ground

1.0104 Fig 11a Berks

1.0105 Cross Bottom p254 Devon
1.0105 Cross Plate IV Bucks Upper
1.0105 Fig 28 Beds
1.0105 Fig 29 Northants
1.0105 Fig 2 HertsA
1.0105 Fig 2 HertsB
1.0105 Fig 2 Suffolk
1.0105 Fig 34 Lincs
1.0105 Fig 3 CambsB
1.0105 Fig 4 Rutland
1.0105 Fig 65 Leics
1.0105 Fig U2 Oxon

1.0106 Fig 15 Hants
1.0106 Fig 58 CambsB
1.0106 Fig 9 Holmes
1.0106 Fig M6 Oxon
1.0106 Plate XVII Bucks Cross

1.0107 Fig 10 Bucks
1.0107 Fig 122a Wilts
1.0107 Fig 12 Rutland
1.0107 Fig 165 Surrey
1.0107 Fig 225a Worcs
1.0107 Fig 43 Suffolk
1.0107 Fig 5 Kent
1.0107 Fig 67 Ellacombe
1.0107 Fig 96 Northants
1.0107 Fig 9a HertsB
1.0107 Fig 9 HertsA
1.0107 Fig De Gloucs
1.0107 Fig V6 Oxon
1.0107 Plate VIII, a Sussex

1.0108? Fig 32 Beds

1.0109 Fig 145a Wilts
1.0109 Fig 19 Devon
1.0109 Fig 1a Walters 1918
1.0109 Fig 24 Witts
1.0109 Fig 34 Berks
1.0109 Fig 59 Ellacombe
1.0109 Fig 59 Walters 1893
1.0109 Fig 60 Gloucs
1.0109 Fig 60 Here
1.0109 Fig 6c Wilts
1.0109 Fig 74 Somerset
1.0109 Hillmarton Cross
1.0109 Plate VIIa Hawkins 1938

1.0110 Fig 31 Beds

1.0111 Fig 103a Berks
1.0111 Fig 3 HertsA
1.0111 Fig 3 HertsB
1.0111 Rawreth Cross
1.0111 Clothall Cross

1.0112 Fig 128 Lincs
1.0112 Fig 13 NottsC

1.0113 Fig 20 Witts
1.0113 Fig 2 Ellacombe

1.0114 Fig 29 Greenwood
1.0114 Plate 1, a Staffs
1.0114 Plate 133, 1 Staffs

1.0115 Plate 133, 8 Staffs

1.0116 Plate 133, 2 Staffs
1.0116 Plate 4, a Staffs

1.0117 Plate 133, 13 Staffs
1.0117 Plate 34a Staffs

1.0118 Plate 133, 7 Staffs
1.0118 Plate 13a Staffs

1.0119 Fig 113b Wilts
1.0119 Fig 95 Somerset

1.0120 Fig 27 Hants
1.0120 Fig 33a Dorset
1.0120 Fig 65a Dorset

1.0121 Plate 133, 10 Staffs
1.0121 Plate 19a, a Staffs

1.0122 Fig 107a Wilts
1.0122 Fig 64 Ellacombe
1.0122 Ogborne St Andrew Cross

1.0123 Fig 58 Ellacombe

1.0124 Fig 104 Ellacombe
1.0124 Fig 104 Walters 1893

1.0125 Fig 24 Lincs
1.0125 Fig 89 Northants

1.0126 Fig 25 at p137 Cumb

1.0127 Fig 68 CambsB
1.0127 Fig 74 Suffolk
1.0127 Plate II, 2 TyssenA
1.0127 Plate II, 2 TyssenB
1.0127 Plate XX, 2 Essex

1.0128 Conistone-with-kilnsey Cross
1.0128 Fig 22 Lincs
1.0128 Fig 37 Lincs
1.0128 Fig 39 Poppleton
1.0128 Fig 67 Poppleton
1.0128 Fig 69 at p515 Devon
1.0128 Long Marston Cross

1.0129 Cross at p252 DerbyB
1.0129 Fig 119 Sheffield

1.0129 Fig 140 DerbyA
1.0129 Fig 168 DerbyA
1.0129 Fig 168 DerbyB
1.0129 Fig 28 Rutland
1.0129 Fig 39 Leics
1.0129 Fig 52 Lincs
1.0129 Fig 57 Lincs
1.0129 Fig 84 Northants
1.0129 Plate 133, 3 Staffs
1.0129 Plate 133, 5 Staffs
1.0129 Plate 6d Staffs
1.0129 Plate 9a Staffs
1.0129 Plate IX, 6 Warks
1.0129 Plate XXIII, 1 Salop

1.0130 Fig 169a Worcs

1.0131 Plate XIX Bucks Cross

1.0132 Plate XI, 6 Bucks

1.0133 Fig 33b Hants

1.0134 Fig 119a Here
1.0134 Fig 97 Here
1.0134 Stretton Sugwas Cross

1.0135 Fig 160a Worcs
1.0135 Fig 78 Ellacombe
1.0135 Fig 95 Gloucs
1.0135 Fig 95 Here

1.0136 Aythorpe Roothing Cross
1.0136 Fig 26 Cambs
1.0136 Fig 67 CambsB
1.0136 Fig 73 Suffolk
1.0136 John Tonne's Usual Large Cross
1.0136 Plate I, 1 TyssenA
1.0136 Plate I, 1 TyssenB
1.0136 Plate XVIII, a Sussex
1.0136 Plate XX, 1 Essex
1.0136 Plate XVIII, a Sussex

1.0137 Fig 20 Lincs

1.0138 Fig 111 Here

1.0139 Fig 129a Here

1.0140 Fig 103 NottsC
1.0140 Fig 11a NottsA
1.0140 Fig 58 Lincs

1.0141 Fig 105 Ellacombe
1.0141 Fig 159a Worcs
1.0141 Fig 29 Gloucs
1.0141 Fig 29 Here
1.0141 Fig 41a Worcs
1.0141 Fig 44a Worcs
1.0141 Plate III, a Warks
1.0141 Plate IV, 1 Salop

1.0142 Fig 106a Here

1.0143 Fig 56 Lincs

1.0144 Fig 123 Lincs

1.0145 Fig 147 NottsC

1.0146 Fig 42 Lincs

1.0147 Fig 40 Lincs

1.0148 Fig 108 Sheffield
1.0148 Fig 75 Lincs

1.0149 Fig 66 Lincs

1.0150 Fig 51 Lincs

1.0151 Fig 47 Lincs

1.0152 Fig 21 Lincs
1.0152 Fig 64 Northants

1.0153 Fig 25a Worcs
1.0153 Fig 27 Gloucs
1.0153 Fig 27 Here
1.0153 Fig 29 Witts
1.0153 Fig 30a Worcs
1.0153 Fig 52 Ellacombe
1.0153 Plate 134, b Gloucs
1.0153 Credenhill Cross

1.0154 Fig 143a Worcs
1.0154 Fig 233a Worcs
1.0154 Plate VII, 10 Warks
1.0154 Plate VII, 4 Warks
1.0154 Plate XXV, 10 Salop
1.0154 Wrockwardine Cross

1.0155 Fig A at p405 Elphick 1960

1.0156 Fig 79 Lincs

1.0157 Fig 76a Worcs

1.0158 Fig 10 Ellacombe
1.0158 Fig 10 Walters 1893
1.0158 Fig 13 Gloucs
1.0158 Fig 30 Witts
1.0158 Fig 51 Somerset

1.0159 Fig 101 Somerset
1.0159 Fig 83a Dorset

1.0160 Fig 157 DerbyB
1.0160 Fig 15 Leics
1.0160 Fig 18 Cambs
1.0160 Fig 40 CambsB
1.0160 Fig 61 Suffolk
1.0160 Fig 7 Raven 1897
1.0160 Fig 84b Dorset

1.0160 Fig 9 Dorset
1.0160 Plate III, 5 Thurlow
1.0160 Plate X, 67 Devon

1.0161 Breaston Cross
1.0161 Fig 116 Sheffield
1.0161 Fig 43 DerbyA
1.0161 Fig 43 DerbyB
1.0161 Fig 44b DerbyA
1.0161 Fig 44b DerbyB
1.0161 Fig 45 Leics
1.0161 Fig 48, a & d Worcs
1.0161 Fig 64 NottsC
1.0161 Fig 86 Lincs
1.0161 Fig 88 at p518 Devon
1.0161 Plate 11a Staffs
1.0161 Plate 133, 6 Staffs
1.0161 Plate VII, 16 Warks

1.0162 Cross at p40 Lancs

1.0163 Fig 10 Cockey
1.0163 Fig 111a Wilts
1.0163 Fig 132a Wilts
1.0163 Fig 133a Wilts
1.0163 Fig 134a Wilts
1.0163 Fig 155a Wilts
1.0163 Fig 172a Wilts
1.0163 Fig 186 Wilts
1.0163 Fig 24c Wilts
1.0163 Fig 25c Wilts
1.0163 Fig 29 Ellacombe
1.0163 Fig 29 Walters 1893
1.0163 Fig 2 Witts
1.0163 Fig 3a Walters 1918
1.0163 Fig 47 Gloucs
1.0163 Fig 47 Here
1.0163 Fig 48a Dorset
1.0163 Fig 51 Devon
1.0163 Fig 61 Somerset
1.0163 Fig 68a Wilts
1.0163 Fig 69a Wilts
1.0163 Fig 7 Cornwall
1.0163 Fig 80a Wilts
1.0163 Fig 83a Wilts
1.0163 Fig 86a Wilts
1.0163 Fig 88a Wilts
1.0163 Fig 91a Wilts
1.0163 Plate 5c Gloucs

1.0164 Fig 35a Wilts
1.0164 Fig 61 Gloucs
1.0164 Fig 61 Here
1.0164 Fig 72 Ellacombe
1.0164 Fig 9 Somerset
1.0164 Plate 4 Gloucs

1.0165 Austen Bracker's Cross
1.0165 Cross 1.9 Cattermole
1.0165 Cross at p56 Norfolk
1.0165 Fig 40 Leics
1.0165 Fig 71 CambsB
1.0165 Fig 17 Cambs
1.0165 Plate XIIb Hawkins 1938

1.0166 Fig 51a Dorset
1.0166 Fig 9 Devon

1.0167 Plate 133, 4 Staffs
1.0167 Plate 6b Staffs

1.0168 Fig 120 DerbyB
1.0168 Fig 123 NottsC
1.0168 Fig 64 Leics
1.0168 Fig 96 Lincs
1.0168 Plate 133, 14 Staffs
1.0168 Plate 35, a Staffs
1.0168 Stapleford Cross

1.0169 Illus A p291 Gaythorpe

1.0170 Fig 4b Wilts

1.0171 Fig 31 Somerset

1.0172 Cross at p141 Cumb
1.0172 Cross at p196 Durham

1.0173 Cross 1.8 Cattermole
1.0173 Cross Plate I Kent
1.0173 Cross Plate V Suffolk
1.0173 Fig 95 Lincs
1.0173 Plate I Row 5d Thurlow

1.0174 Fig 63 DerbyB

1.0175 Fig 87 Northants

1.0176 Fig 82 Northants

1.0177 Fig 120 Northants

1.0178 Fig 121b Wilts

1.0179 Fig 112 Northants

1.0180 Fig 51 Worcs
1.0180 Fig 58 Leics
1.0180 Fig 63 Northants
1.0180 Plate II, 1 Warks

1.0181 Fig 10c NottsA
1.0181 Fig 97 NottsC

1.0182 Fig 24 Cornwall
1.0182 Fig 30 Rutland
1.0182 Fig 41 Lincs
1.0182 Fig 45a Dorset
1.0182 Fig 4 Devon
1.0182 Fig 4 Somerset
1.0182 Fig 54 Northants
1.0182 Fig 83 Leics

1.0183 Fig 13 Cornwall

1.0183 Fig 1 Devon
1.0183 Fig 1 Somerset
1.0183 Fig 50 Dorset

1.0184 Fig 20 Devon
1.0184 Fig 29 Somerset
1.0184 Fig 54a Dorset

1.0185 Fig 81 Devon

1.0186 Fig 82 Leics

1.0187 Bury cross in lozenge
1.0187 Fig 11b HertsB
1.0187 Fig 54 CambsB
1.0187 Fig 67 Suffolk
1.0187 Fig 73 Northants
1.0187 Plate XVIII, 5 Essex
1.0187 Plate XVII, 1 & 2 Hawkins 1938
1.0187 Plate XIXq Hawkins 1938
1.0187 Plate XXI, 2 Hawkins 1938

1.0188 Fig 108 DerbyA
1.0188 Fig 108 DerbyB
1.0188 Fig 42 Leics
1.0188 Fig 45 Northants
1.0188 Fig 50 at p512 Devon
1.0188 Fig 93 Lincs
1.0188 Illus A at p47 DerbyB
1.0188 Plate VIIIa Warks

1.0189 Fig 145 DerbyA
1.0189 Fig 145 DerbyB

1.0190 Fig 81 Berks
1.0190 Plate XII, b1 Sussex

1.0191 Fig 47 DerbyA
1.0191 Fig 47 DerbyB

1.0192 Fig 29e HertsB
1.0192 Fig 92a Dorset

1.0193 Fig 1 Suffolk
1.0193 Square Cross at p23 Norfolk
1.0193 Plate XXVIIa Hawkins 1938

1.0194 Cross 1.4 Cattermole
1.0194 Cross 2 at p32 Norfolk
1.0194 Cross at p33 Norfolk

1.0195 Fig 61 Poppleton
1.0195 Fig 61 Sheffield

1.0196 Fig 35 Poppleton
1.0196 Fig 35 Sheffield

1.0197 Plate IX, 8 Salop

1.0198 Fig 17 Hunts
1.0198 Fig 33 Rutland
1.0198 Fig 76 Leics
1.0198 Plate IX, 1 Warks

1.0199 Fig 94 Lincs

1.0200 Fig 51a Leics

1.0201 Fig 116 Lincs
1.0201 Plate VIII, 4 Cheshire V

1.0202 Fig 44a Hants

1.0203 Fig 100a Wilts
1.0203 Fig 109a Wilts
1.0203 Fig 10a Wilts
1.0203 Fig 118a Wilts
1.0203 Fig 11b Wilts
1.0203 Fig 120a Wilts
1.0203 Fig 139a Wilts
1.0203 Fig 14 Cornwall
1.0203 Fig 176a Wilts
1.0203 Fig 184 Wilts
1.0203 Fig 24 Chitty
1.0203 Fig 24 Hants
1.0203 Fig 26a Dorset
1.0203 Fig 32a Wilts
1.0203 Fig 39 Ellacombe
1.0203 Fig 44a Wilts
1.0203 Fig 45a Wilts
1.0203 Fig 49a Dorset
1.0203 Fig 4a Wilts
1.0203 Fig 65a Wilts
1.0203 Fig 7 Devon
1.0203 Fig 7 Somerset
1.0203 Fig 86a Dorset
1.0203 Plate VII, c1 Sussex

1.0204 Fig 2b Walters 1906b
1.0204 Plate XVII, f Sussex

1.0205 Doddinghurst Cross
1.0205 Fig 7c Walters 1906b
1.0205 Plate XVII, e Sussex
1.0205 Plate XXXb Hawkins 1938

1.0206 Cross at p77 Norfolk

1.0207 Plate XV, 1 Salop

1.0208 Fig 94a Dorset

1.0209 Fig 38 Somerset

1.0210 Fig 85b Poppleton

1.0211 Fig K2 Oxon

1.0212 Cross 1.11 Cattermole
1.0212 Cross 1.3 Cattermole
1.0212 Cross at p26 Norfolk
1.0212 Fig 47 Suffolk
1.0212 Plate at p27a Norfolk
1.0212 Plate III, 6 Thurlow

1.0212 Plate XVII, 1 Essex
1.0212 Potter's Cross
1.0212 Plate IXa Hawkins 1938
1.0212 Plate XIVa Hawkins 1938
1.0212 Plate XXIXa Hawkins 1938

1.0213 CrossA at p79 Durham

1.0214 CrossB at p79 Durham

1.0215 Cross at p128 Lancs Upper

1.0216 Cross at p128 Lancs

1.0217 Cross 2 at p40 Lancs

1.0218 Cross at p138 Lancs Lower

1.0219 Fig 154a Worcs
1.0219 Plate VI, 6a Warks

1.0220 Plate VI, 5 Warks

1.0221 Fig 14 Suffolk
1.0221 Fig 18 Lincs
1.0221 Fig 37d Hants
1.0221 Plate X, 4 Essex

1.0222 Fig 7 Kent

1.0223 Fig 52 Oxon
1.0223 Fig 29 at p509 Devon

1.0224 Plate Ia Warks

1.0225 Plate VIIIa Salop

1.0226 Fig 85a Dorset

1.0227 Fig 59 DerbyA

1.0228 Cross at p25 Norfolk
1.0228 Plate I Row 4a Thurlow

1.0229 Fig 3a Oxon
1.0229 Fig B5 Oxon

1.0230 Fig 43a Hants
1.0230 Fig 63a Dorset
1.0230 Fig 65 DerbyA
1.0230 Fig 65 DerbyB

1.0231 Fig 30a Dorset

1.0232 Fig 64a Dorset

1.0233 Cross at p80 Lancs Bottom

1.0234 Cross p274 Durham
1.0234 Fig 79 Poppleton

1.0235 Fig 183 Wilts
1.0235 Fig 28 Hants
1.0235 Fig 93 Somerset

1.0236 Fig 10 Salop

1.0237 Plate XIX, 1 Salop

1.0238 Fig 78 Leics

1.0239 Fig 1 Hunts

1.0240 Plate XX, 1 Salop
1.0240 Recercle Cross

1.0241 Fig 14 CambsB
1.0241 Fig 56 Leics
1.0241 Fig 69 NottsC
1.0241 Fig 93 Northants

1.0242 Fig 48 Devon

1.0243 Cross at p284 Walters 1912
1.0243 Fig 3a at p28 Warks

1.0244 Cross at p80 Lancs Lower
1.0244 Fig 112 Sheffield
1.0244 Fig 12 NottsC
1.0244 Fig 140 Lincs
1.0244 Fig 27 Northants
1.0244 Fig 33 Hunts
1.0244 Fig 41 Greenwood
1.0244 Fig 6 Rutland
1.0244 Fig 72 DerbyA
1.0244 Fig 72 DerbyB
1.0244 Fig 74 Leics
1.0244 Plate X, 9 Warks
1.0244 Warmfield Cross

1.0245 Fig 13 CambsB
1.0245 Fig 3 Raven 1902
1.0245 Fig 46 Northants
1.0245 Fig 55 Leics
1.0245 Fig 66 NottsC

1.0246 Fig 7b at p425 Durham
1.0246 Fig 8a Fowler 1865
1.0246 Heighington Cross
1.0246 Sedgefield Cross

1.0247 Fig 33a Wilts
1.0247 Fig 41a Hants
1.0247 Fig 55a Dorset
1.0247 Fig 55a Wilts
1.0247 Plate III, 8a Essex
1.0247 Plate VI, g Sussex

1.0248 Fig 30 Kent

1.0249 Fig 21a Dorset

1.0250 Fig 68a Dorset

1.0251 Fig 77 Suffolk
1.0251 Plate II, 3 TyssenA
1.0251 Plate II, 3 TyssenB
1.0251 Plate XIX, c Sussex

1.0252 Cross Fig 165 Wilts

1.0253 Fig 10 HertsA
1.0253 Fig 10 HertsB
1.0253 XLIII, a1, a3, b2, & f2 Sussex

1.0254 Fig 1 HertsA
1.0254 Fig 1 HertsB

1.0255 Fig 29 Kent

1.0256 Fig 163a Surrey

1.0257 Fig 162 Surrey

1.0258 Alton Pancras Plain Cross
1.0258 Fig 31a Dorset

1.0259 Fig 175a Wilts
1.0259 Fig 42a Wilts
1.0259 Fig 49a Hants
1.0259 Fig 5a Wilts
1.0259 Fig 56a Wilts

1.0260 Plate III, 10a Salop

1.0261 Fig 60a Dorset

1.0262 Cross at p20 Lancs Upper

1.0263 Cross at p132 Lancs Upper

1.0264 Cross at p132 Lancs Lower

1.0265 Fig 69 Leics
1.0265 Plate II, 14 Warks

1.0266 Fig 35c Dorset
1.0266 Fig 62a Dorset
1.0266 Fig 91 Somerset

1.0267 Fig 111 Northants
1.0267 Fig 28e HertsB
1.0267 Fig 42b TyssenB
1.0267 Plate XIV, 1 Essex
1.0267 Plate XVI, e1 Sussex

1.0268 Cross Plate XXVII Bucks
1.0268 Fig 108 Somerset
1.0268 Fig 51 Northants

1.0269 Fig 12 CambsB
1.0269 Fig 54 Leics
1.0269 Fig 68 NottsC
1.0269 Fig 90 Northants

1.0270 Fig 40 Somerset

1.0271 Fig 59a Dorset

1.0272 Fig 87a Dorset

1.0273 Fig 88 Dorset
1.0273 Fig 90b Dorset

1.0274 Fig 28a Dorset

1.0275 Cross at p92 Lancs

1.0276 Cross at p42 Lancs

1.0277 Fig 21 at p132 Cumb

1.0278 Fig 11 Greenwood
1.0278 Fig 24 Poppleton
1.0278 Fig 24 Sheffield

1.0279 Fig 98b Berks
1.0279 Fig A7 Oxon
1.0279 Plate VIII, 1 Essex
1.0279 Cross Plate VIII Bucks Upper

1.0280 Cross Plate VI Bucks Upper
1.0280 Cross Plate VI Bucks Lower
1.0280 Fig 107 Northants
1.0280 Fig 28a Oxon
1.0280 Fig D13 Oxon
1.0280 Plate VII Bucks Cross

1.0281 Fig 110 Northants
1.0281 Plate 137a Gloucs
1.0281 Plate VI, b Sussex
1.0281 Cross Plate V Bucks

1.0282 Cross Plate I Bucks Lower
1.0282 Fig L2 Oxon

1.0283 Fig 11 TyssenA
1.0283 Fig 11 TyssenB
1.0283 Fig 39b TyssenB
1.0283 Plate VII, b1 Sussex

1.0284 Cross at p185 Walters 1912
1.0284 Cross Plate II Surrey
1.0284 Fig 10 TyssenA
1.0284 Fig 10 TyssenB
1.0284 Fig 2a at p27 Warks
1.0284 Fig 33a TyssenB
1.0284 Fig 69a Dorset
1.0284 Fig N12 Oxon
1.0284 Goring Cross
1.0284 Iwerne Minster Cross
1.0284 Plate II, 16 Essex
1.0284 Plate IV, b1 Sussex
1.0284 Plate IVa Hawkins 1938

1.0285 Cross Plate IV Surrey
1.0285 Fig 1 TyssenA
1.0285 Fig 1 TyssenB

1.0285 Fig 49a TyssenB
1.0285 Plate III, c1 Sussex
1.0285 Plate IV, a1 Sussex

1.0286 Crostwight Cross

1.0287 Cross 1.2 Cattermole

1.0288 Cross 1.5 Cattermole
1.0288 Plate Xb Hawkins 1938
1.0288 Plate XXVIa Hawkins 1938

1.0289 Plate I Row 5a Thurlow
1.0289 Cross 2.2 Cattermole

1.0290 Cross Fig 164 Wilts

1.0291 Fig 86 Poppleton

1.0292 Cross A at p132 Lancs Lower
1.0292 Illus A at p55 Walters 1912

1.0293 Plate 133, 18 Staffs

1.0294 Fig 104 NottsC

1.0295 Fig 79 NottsC

1.0296 Fig 122 NottsC

1.0297 Fig 107 NottsC

1.0298 Fig 151 NottsC

1.0299 Fig 121 Sheffield

1.0300 Illus B at p7b DerbyB

1.0301 Fig 14a HertsB

1.0302 Fig 69a HertsB

1.0303 Fig 6 Greenwood

1.0304 Fig 96 DerbyB

1.0305 Fig 161 DerbyB

1.0306 Plate XVIII, 4 Essex
1.0306 Bury cross in octagon
1.0306 Plate XVII, 5 Hawkins 1938
1.0306 Plate XVIII, a Hawkins 1938
1.0306 Plate XXII, b & g Hawkins 1938
1.0306 Plate XXIII, b & i Hawkins 1938
1.0306 Plate XXIV, a Hawkins 1938

1.0307 Bury cross in square
1.0307 Plate XVII, 3 & 10 Hawkins 1938
1.0307 Plate XVIII, c Hawkins 1938
1.0307 Plate XIX, c, g, & l Hawkins 1938
1.0307 Plate XX, b Hawkins 1938

1.0308 Plate IIc Hawkins 1938

1.0309 Plate at p208, C DerbyB

1.0310 Fig 38a Bell *et al* 1987

Stops

2.0001 Plate XI, 4 Bucks

2.0002 Fig 1 Bucks
2.0002 Fig 30 Devon
2.0002 Fig 80c Berks
2.0002 Fig 85 Berks
2.0002 Fig 8 HertsA
2.0002 Fig 8 HertsB
2.0002 Fig C at p310 Draper
2.0002 Plate VIII, 5 Essex
2.0002 Stop 6 at p51 Norfolk

2.0003 Fig 42c Hants
2.0003 Plate IV Bucks Upper Stop

2.0004 Fig 16c Oxon
2.0004 Fig 182 Surrey
2.0004 Fig 48 Berks
2.0004 Fig 63b Berks
2.0004 Fig E15 Oxon
2.0004 Plate at p48 Holmes 1987 (E)
2.0004 Plate XVI Bucks Large Stop

2.0005 Fig 55 Berks
2.0005 Fig 88c Berks
2.0005 S-shaped Stop

2.0006 Fig 16 HertsA
2.0006 Fig 23b HertsB
2.0006 Fig 2 TyssenA
2.0006 Fig 2 TyssenB
2.0006 Fig 38 Bucks
2.0006 Fig 7 Hants
2.0006 Fig 9 Holmes 1987
2.0006 Fig E13 Oxon
2.0006 Plate at p59 Holmes 1987 (B)
2.0006 Plate at p60 Holmes 1987 (B)
2.0006 Plate XVI Bucks Smallest Stop

2.0007 Fig 22 Hants
2.0007 Fig 8 Holmes 1987
2.0007 Holmes 1987 Plate at p19 (B)
2.0007 Plate XIX Bucks Stop

2.0008 Fig 73 Ellacombe
2.0008 Fig 76 Glouc
2.0008 Fig 76 Here
2.0008 Fig 84 Ellacombe
2.0008 Plate III, c Warks
2.0008 Plate IV, 8 Salop

2.0009 Fig 106c Here

2.0010 Plate 80a Glouc s

2.0011 Plate 137c Glouc s

2.0012 Fig 80 Ellacombe

2.0013 Fig 4c Walters 1918

2.0014 Fig 77 Lincs

2.0015 Fig 23 Lincs

2.0016 Fig 28f HertsB
2.0016 Plate XIII, 13 Warks
2.0016 Plate XVI, d Sussex

2.0017 Plate 11c Staffs
2.0017 Plate 12b Staffs
2.0017 Plate 134, 7 Staffs

2.0018 Plate VII, 2 Warks

2.0019 Fig 160c Worcs

2.0020 Fig 39 Greenwood
2.0020 Fig 45 Lincs
2.0020 Fig 83 Poppleton
2.0020 Fig 8 at p425 Durham
2.0020 Heighington Stop
2.0020 Fig 8c Fowler 1865

2.0021 Fig 33d Hants

2.0022 Plate 5a Glouc s

2.0023 Fig 83 Ellacombe

2.0024 Plate 142a Glouc s

2.0025 Fig 1e Worcs
2.0025 Fig 2d Worcs

2.0026 Fig 40a Worcs
2.0026 Fig 44c Worcs

2.0027 Plate 134, 13b Staffs
2.0027 Plate 34d Staffs

2.0028 Plate 134, 13a Staffs
2.0028 Plate 34c Staffs

2.0029 Fig 78a Lincs
2.0029 Plate XIII (iii) Lincs

2.0030 Fig 13 at p493 Cumb

2.0031 Fig 8 at p493 Cumb

2.0032 Fig 63 Lincs

2.0033 Fig 111 NottsC
2.0033 Fig 67 Lincs

2.0034 Fig 43 Lincs
2.0034 Fig 60 NottsC

2.0035 Fig 179 Lincs

2.0036 Plate XVIII, 6 Essex
2.0036 Plate XVII, 12 Hawkins 1938
2.0036 Plate XXI, 1 Hawkins 1938

2.0037 Fig 39 Lincs
2.0037 Fig 41 Poppleton

2.0038 Fig 120 Sheffield
2.0038 Plate 129, 2b Staffs
2.0038 Plate 134, 6 Staffs
2.0038 Plate 6e Staffs
2.0038 Plate 7c Staffs
2.0038 Plate 8b Staffs

2.0039 Fig 15 CambsB
2.0039 Fig 44 Northants
2.0039 Fig 59 Leics
2.0039 Fig 67 NottsC

2.0040 Fig 85a Poppleton

2.0041 Fig 161 Surrey
2.0041 Fig 1c Hants
2.0041 Fig 226c Worcs
2.0041 Fig 2 Holmes 1987
2.0041 Fig 48 Berks uncrowned
2.0041 Plate at p45 Holmes 1987 (C)
2.0041 Plate VI, 4 Essex
2.0041 Plate VIII Surrey Stop
2.0041 Plate XVI Bucks Large Stop Uncrowned

2.0042 Fig 26 at p137 Cumb

2.0043 Plate I Kent Stop
2.0043 Plate V Suffolk Stop

2.0044 Fig 18a Dorset

2.0045 Fig 94c Dorset

2.0046 Plate XIX, g Sussex

2.0047 Stop p193 Durham

2.0048 Fig 104 Sheffield
2.0048 Plate XII, d Poppleton

2.0049 Fig 225c Worcs
2.0049 Fig 92 Somerset
2.0049 Last Stop Plate XVI Bucks

2.0050 Fig 117 Sheffield
2.0050 Fig 48c Worcs
2.0050 Fig 48f Worcs
2.0050 Fig 48 Leics
2.0050 Fig 52b Worcs

2.0050 Fig 65 NottsC
2.0050 Fig 87 Lincs

2.0051 Stop at p132 Lancs Upper

2.0052 Stop at p80 Lancs Bottom

2.0053 Buscot Stop

2.0054 Stop at p128 Lancs Upper
2.0054 Stop at p92 Lancs

2.0055 Stop 2 at p128 Lancs

2.0056 Stop 1 at p128 Lancs

2.0057 Stop at p40 Lancs

2.0058 Stop at p138 Lancs

2.0059 Stop at p42 Lancs

2.0060 Fig 100c Wilts
2.0060 Fig 29b Dorset

2.0061 Fig 15 Gloucs

2.0062 Fig 68 Gloucs
2.0062 Fig 68 Here
2.0062 Fig 79 Ellacombe
2.0062 Fig 79 Walters 1893

2.0063 Fig 27 Devon
2.0063 Fig 85 Ellacombe

2.0064 Fig 133d Wilts
2.0064 Fig 74 Ellacombe

2.0065 Fig 32 at p137 Cumb (*recte* p138)
2.0065 Fig 32 Durham

2.0066 Stop at p196 Durham

2.0067 Fig 169 DerbyA
2.0067 Fig 169 DerbyB

2.0068 Fig 26 Devon
2.0068 Fig 3c Oxon
2.0068 Fig B11 Oxon
2.0068 Fig 82 Ellacombe

2.0069 Plate XII, b2 Sussex

2.0070 Fig 10b NottsA
2.0070 Fig 98 NottsC

2.0071 Fig 83c Wilts
2.0071 Fig 91c Wilts

2.0072 Fig 85b Dorset

2.0073 Fig 25b Wilts
2.0073 Fig 4 Cornwall
2.0073 Fig 86d Wilts

2.0074 Fig 159c Worcs

2.0075 Fig 25 Devon
2.0075 Fig 86 Ellacombe
2.0075 Fig 8 Witts

2.0076 Fig 109c Wilts
2.0076 Fig 111b Wilts
2.0076 Fig 41 Somerset
2.0076 Fig 48b Dorset
2.0076 Fig 59b Dorset

2.0077 Fig 15 Ellacombe
2.0077 Fig 2c Walters 1918
2.0077 Fig 48 Somerset
2.0077 Fig 60 at p514 Devon
2.0077 Fig 72 Here
2.0077 Plate at p366d Tyssen 1908

2.0078 Fig 107c Wilts
2.0078 Fig 132c Wilts
2.0078 Fig 155d Wilts
2.0078 Fig 172d Wilts
2.0078 Fig 24 Devon
2.0078 Fig 3d Walters 1918
2.0078 Fig 45 Somerset
2.0078 Fig 69 Gloucs
2.0078 Fig 80d Wilts
2.0078 Fig 81 Ellacombe
2.0078 Fig 9 Cockey

2.0079 Fig 55 CambsB
2.0079 Fig 68 Suffolk
2.0079 Fig 72 Northants
2.0079 Plate XVII, 7 Hawkins 1938
2.0079 Plate XVIII, f Hawkins 1938
2.0079 Plate XXII, c & h Hawkins 1938

2.0080 Fig 132b Wilts
2.0080 Fig 145c Wilts
2.0080 Fig 3 Suffolk
2.0080 Fig 4 Hunts
2.0080 Fig 5 CambsB
2.0080 Fig 69c Dorset
2.0080 Plate IVc Hawkins 1938

2.0081 Fig 114 DerbyA
2.0081 Fig 114 DerbyB
2.0081 Fig 42 Northants
2.0081 Fig 43 Leics
2.0081 Fig 51 at p512 Devon
2.0081 Plate VIIIc Warks

2.0082 Fig 63b Dorset

2.0083 Fig 141 DerbyA
2.0083 Fig 77 Leics

2.0084 Fig 11d Wilts

2.0084 Fig 73a Dorset

2.0085 Fig 23c Hants
2.0085 Fig 81c Dorset
2.0085 Fig 43c Dorset

2.0086 Plate XIX, i Sussex

2.0087 Fig 31 at p137 Cumb (*recte* p138)
2.0087 Fig 31 Durham

2.0088 Fig 96c Dorset

2.0089 Fig 29 Hants
2.0089 Fig 86c Dorset

2.0090 Plate XV, 9 Salop

2.0091 Plate X, 1 Salop

2.0092 Fig 103 Somerset

2.0093 Fig 72 Suffolk

2.0094 Fig 15 Rutland
2.0094 Fig 57 Leics

2.0095 Fig 2 Hunts

2.0096 Fig 83c Dorset

2.0097 Fig 156b Wilts

2.0098 Fig 93c Dorset

2.0099 Fig 93a Dorset

2.0100 Plate XVI, e3 Sussex

2.0101 Fig 10 Hunts
2.0101 Fig 36a Hants
2.0101 Fig 47 Devon
2.0101 Fig 52b Dorset
2.0101 Fig 7 Holmes
2.0101 Stop 5 p51 Norfolk

2.0102 Plate XIX, f Sussex

2.0103 Illus C at p22 Walters 1912
2.0103 Stop at p132 Lancs Lower

2.0104 Fig 4b Walters 1906b
2.0104 Plate XIV, 6 Essex

2.0105 Fig 12 Ellacombe
2.0105 Fig 91 Devon

2.0106 Fig 30 at p509 Devon
2.0106 Fig 38 Ellacombe
2.0106 Fig 43c Wilts
2.0106 Fig 67 Somerset
2.0106 Fig 70 Glouc s
2.0106 Fig 70 Here
2.0106 Fig T10 Oxon
2.0106 Plate at p366c Tyssen 1908

2.0107 Fig 23c Dorset
2.0107 Fig 4f Walters 1906b
2.0107 Fig 56 Ellacombe
2.0107 Plate X, a2 Sussex
2.0107 Plate XVII, c Sussex
2.0107 Sturdy Half-Groat

2.0108 Fig 37b Dorset

2.0109 Fig 6b Wilts
2.0109 Fig 99b Wilts

2.0110 Fig 5e Wilts

2.0111 Fig 159 DerbyB

2.0112 Fig 78a Wilts

2.0113 Fig 17 Witts
2.0113 Fig 37 Ellacombe
2.0113 Fig 58 Somerset
2.0113 Fig 6b Walters 1918

2.0114 Fig 11c HertsB
2.0114 Fig 21 Cambs
2.0114 Plate XVIII, 9 Essex
2.0114 Stop at p62 Norfolk
2.0114 Plate XVII, 9 Hawkins 1938
2.0114 Plate XIX, e, h, & o Hawkins 1938

2.0115 Fig 110 Surrey
2.0115 Fig 25 Cambs
2.0115 Fig 9 CambsB
2.0115 Stop at p55 Norfolk
2.0115 Plate XXVIIIc Hawkins 1938

2.0116 Fig 22c Dorset

2.0117 Fig 76a Dorset

2.0118 Fig 106c Wilts

2.0119 Fig 11 Ellacombe
2.0119 Fig 11 Walters 1893
2.0119 Fig 1c Walters 1918
2.0119 Fig 55 Somerset
2.0119 Fig 75 Glouc s
2.0119 Fig 75 Here
2.0119 Plate VIIb Hawkins 1938

2.0120 Fig 6 Fowler 1865
2.0120 Scroll at p299 Durham

2.0121 Fig K4 Oxon

2.0122 Fig 44d Dorset

2.0123 Fig 73d Dorset

2.0124 Fig 80 NottsC

2.0125 Fig 17 Suffolk
2.0125 Stop 4 at p50 Norfolk

2.0126 Fig 57 Poppleton

2.0127 Plate XI, g Sussex

2.0128 Fig 72 Somerset

2.0129 Fig 96a Dorset
2.0129 Plate VIII, 8 Essex

2.0130 Fig 107 Somerset

2.0131 Fig 22 Somerset

2.0132 Fig 24 Somerset

2.0133 Fig 29c HertsB
2.0133 Plate 135, 45 Staffs
2.0133 Plate 20e Staffs
2.0133 Plate 21e Staffs

2.0134 Plate 133, 19 Staffs

2.0135 Plate 134, 9 Staffs
2.0135 Plate 19e Staffs

2.0136 Fig 29d HertsB
2.0136 Plate 135, 44 Staffs
2.0136 Plate 20f Staffs
2.0136 Plate 21f Staffs

2.0137 Fig 38 Lincs

2.0138 Plate IV, 10 Essex

2.0139 Plate XXI, 7 Essex

2.0140 Fig 53 Lincs

2.0141 Plate VIII, 7 Essex

2.0142 Fig 44 Lincs
2.0142 Fig 51 Poppleton
2.0142 Fig 75 NottsC

2.0143 Fig 131a Worcs

2.0144 Fig 184 Lincs
2.0144 Plate 10b Staffs
2.0144 Plate 134, 5 Staffs
2.0144 Plate 6f Staffs
2.0144 Plate 8d Staffs
2.0144 Plate 9c Staffs
2.0144 Plate XXIII, 8 Salop

2.0145 Fig 4d Walters 1918

2.0146 Fig 189 Surrey

2.0147 Fig 106d Here

2.0148 Plate 134, 12 Staffs
2.0148 Plate 25d Staffs

2.0149 Plate XV, 13 Salop

2.0150 Fig 4c Warks

2.0151 Fig 4b Warks

2.0152 Fig 66 Leics

2.0153 Fig 18 Witts
2.0153 Fig 31 Devon
2.0153 Fig 59 Here
2.0153 Fig 61 Ellacombe
2.0153 Fig 61 Walters 1893
2.0153 Fig 77a Wilts

2.0154 Fig 37 Somerset

2.0155 Fig 28c Oxon
2.0155 Fig C4 Oxon

2.0156 Crostwight Stop

2.0157 Colon Stop
2.0157 Double Square Dot Stop

2.0158 Dunsforth Bell Stop

2.0159 Tollard Royal Rosette

2.0160 Bouchier Knot

2.0161 Terrington Swastika
2.0161 Fig 20 at p506 Devon

2.0162 Fig C at p405 Sussex

2.0163 Elaborate Stellate Stop

2.0164 Cross Crossletted Stop

2.0165 Fig 8 Ellacombe

2.0166 Fig 70a Dorset

2.0167 Fig 81 NottsC

2.0168 Fig 82 NottsC

2.0169 Fig 123 Sheffield

2.0170 Budby Stop
2.0170 Plate at p263b NottsC

2.0171 Fig 6a HertsB

2.0172 Fig 6b HertsB

2.0173 Plate XVIII, 7 Essex
2.0173 Plate XVII, 6 & 10 Hawkins 1938
2.0173 Plate XVIII, e Hawkins 1938
2.0173 Plate XIX, t Hawkins 1938
2.0173 Plate XX, e Hawkins 1938
2.0173 Plate XXIII, c & j Hawkins 1938
2.0173 Plate XXIV, c Hawkins 1938

2.0174 Plate IIb Hawkins 1938

2.0175 Plate VIb Hawkins 1938

2.0176 Plate XII, a Hawkins 1938

2.0177 Plate XVII, 16 & 18 Hawkins 1938
2.0177 Plate XXIV, f Hawkins 1938

2.0178 Fig 75 Northants
2.0178 Plate XVII, 14 Hawkins 1938
2.0178 Plate XXIV, j Hawkins 1938
2.0178 Plate XXI, 3 Hawkins 1938
2.0178 Plate XXIX, d Hawkins 1938

2.0179 Plate at p208b DerbyB

Shields

3.0001 Chamberlyn Shield
3.0001 Cross Keys Shield
3.0001 Fig 11 Cambs
3.0001 Fig 12 Beds
3.0001 Fig 16 Cornwall
3.0001 Fig 186 Surrey
3.0001 Fig 19 Northants
3.0001 Fig 19 Somerset
3.0001 Fig 21 TyssenA
3.0001 Fig 21 TyssenB
3.0001 Fig 25 Hunts
3.0001 Fig 25 Suffolk
3.0001 Fig 26 HertsB
3.0001 Fig 27 Bucks
3.0001 Fig 27 Kent
3.0001 Fig 27 Lincs
3.0001 Fig 2 Raven 1897
3.0001 Fig 30 HertsA
3.0001 Fig 31 CambsB
3.0001 Fig 44 Devon
3.0001 Fig 4 Dorset
3.0001 Fig 63 at p514 Devon
3.0001 Fig 76 Poppleton
3.0001 Fig 78a Dorset
3.0001 Fig 95c Wilts
3.0001 Fig C1 Oxon
3.0001 Plate 129, 6 Staffs
3.0001 Plate 25, a Staffs
3.0001 Plate XI, 17 Warks
3.0001 Plate XI, 1 Lukis
3.0001 Plate XII, 4 Essex
3.0001 Plate XV, b Sussex

3.0001 Shield at p52 Norfolk

3.0002 Banner Shield
3.0002 Fig 12 Cambs
3.0002 Fig 13 Beds
3.0002 Fig 17 Cornwall
3.0002 Fig 188 Surrey
3.0002 Fig 20 Northants
3.0002 Fig 21 Somerset
3.0002 Fig 22 TyssenA
3.0002 Fig 22 TyssenB
3.0002 Fig 25 HertsB
3.0002 Fig 25 Kent
3.0002 Fig 26 Hunts
3.0002 Fig 26 Suffolk
3.0002 Fig 28 Bucks
3.0002 Fig 29 HertsA
3.0002 Fig 29 Lincs
3.0002 Fig 32 CambsB
3.0002 Fig 3 Raven 1897
3.0002 Fig 46 Devon
3.0002 Fig 5 Dorset
3.0002 Fig 64 at p514 Devon
3.0002 Fig 75 Poppleton
3.0002 Fig 78c Dorset
3.0002 Fig 95e Wilts
3.0002 Fig C3 Oxon
3.0002 Plate XI, 15 Warks
3.0002 Plate XII, 6 Essex
3.0002 Plate XV, d Sussex
3.0002 Shield at p52 Norfolk

3.0003 3 Lions Passant Guardant
3.0003 Fig 148d Wilts
3.0003 Fig 14 Beds
3.0003 Fig 16 Kent
3.0003 Fig 19 Bucks
3.0003 Fig 26d Worcs
3.0003 Fig 28d HertsB
3.0003 Fig 33 HertsA
3.0003 Fig 38c Hants
3.0003 Fig 39 Worcs
3.0003 Fig 5 Holmes
3.0003 Plate 136, 56 Staffs
3.0003 Plate 24d Staffs
3.0003 Plate I, 3 Salop
3.0003 Plate XII, 3 Essex

3.0004 Fig 12 Cornwall
3.0004 Fig 148e Wilts
3.0004 Fig 15 Kent
3.0004 Fig 16 Beds
3.0004 Fig 20 Bucks
3.0004 Fig 26e Worcs
3.0004 Fig 31 Northants
3.0004 Fig 38c Hants
3.0004 Fig 38 Worcs
3.0004 Fig 4 Holmes
3.0004 Plate I, 2 Salop
3.0004 Plate XII, 1 Essex
3.0004 RC Shield

3.0005 Fig 114 NottsC
3.0005 Fig 12 Northants
3.0005 Fig 17 Kent
3.0005 Fig 19 HertsB
3.0005 Fig 20a HertsA
3.0005 Fig 20 Suffolk
3.0005 Fig 21e Oxon
3.0005 Fig 23 Bucks
3.0005 Fig 23 Hunts
3.0005 Fig 30 Leics
3.0005 Fig 31 TyssenB
3.0005 Fig 32 Lincs
3.0005 Fig 35 Rutland
3.0005 Fig 37 CambsB
3.0005 Fig 3 Fowler 1865
3.0005 Fig 3 at p195 Durham
3.0005 Fig 40 Berks
3.0005 Fig 40 Devon
3.0005 Fig 59 Poppleton
3.0005 Fig 59 Sheffield
3.0005 Fig 7 Beds
3.0005 Fig C14 Oxon
3.0005 Plate XIII, 11 Warks
3.0005 Plate XV, h Sussex
3.0005 Quartered Royal Arms Uncrowned

3.0006 Fig 113 Ellacombe
3.0006 Fig 14 Somerset
3.0006 Fig 15 Cambs
3.0006 Fig 19 Suffolk
3.0006 Fig 20a HertsA Crowned
3.0006 Fig 229e Worcs
3.0006 Fig 23 Leics
3.0006 Fig 24 Bucks
3.0006 Fig 26 Witts
3.0006 Fig 30 Lincs
3.0006 Fig 31 TyssenB Crowned
3.0006 Fig 35 CambsB
3.0006 Fig 43 Northants
3.0006 Fig 9 Beds
3.0006 Illus at p14 Ad CambsB
3.0006 Illus at p14 Cc CambsB
3.0006 Royal Arms Crowned

3.0007 Fig 15 Bucks
3.0007 Fig 19 CambsB
3.0007 Fig 22 Kent
3.0007 Fig 26 Beds
3.0007 Fig 31 Suffolk
3.0007 Fig 37a Dorset
3.0007 Fig 3 Cambs
3.0007 Fig 55 Lincs
3.0007 Fig 74d Wilts
3.0007 Fig B Plate at p27 Pipe
3.0007 Plate VI, 9 Essex
3.0007 Plate X, 1 Lukis

3.0008 Cross & Ring Shield with Loz
3.0008 Fig 12 Bucks
3.0008 Fig 21 HertsB
3.0008 Fig 23 HertsA
3.0008 Fig 42 Devon
3.0008 Lozenged Hille Shield
3.0008 Plate IX, b1 Sussex

3.0009 Fig 112 Ellacombe
3.0009 Fig 112 Walters 1893
3.0009 Fig 169 Surrey
3.0009 Fig 18 TyssenA
3.0009 Fig 18 TyssenB
3.0009 Fig 19 Kent
3.0009 Fig 22 Cornwall
3.0009 Fig 23 Suffolk
3.0009 Fig 29 Rutland
3.0009 Fig 2 Cambs
3.0009 Fig 33 Northants
3.0009 Fig 4 Bucks
3.0009 Fig 56 CambsB
3.0009 Fig 5 Beds
3.0009 Fig Da Gloucs
3.0009 Fig V5 Oxon
3.0009 Plate VI, 8 Essex

3.0010 Coin with Lozenge
3.0010 Fig 14 Bucks
3.0010 Fig 171a Surrey
3.0010 Fig 34b Hants
3.0010 Fig 35b Hants
3.0010 Plate X, e Sussex

3.0011 Fig 21 Beds
3.0011 Fig 71 Northants
3.0011 Rectangular TB Shield

3.0012 Fig 17 Beds
3.0012 Fig 22 Cambs
3.0012 Fig 25 TyssenA
3.0012 Fig 25 TyssenB
3.0012 Fig 28a HertsB
3.0012 Fig 28 Kent
3.0012 Fig 29 Suffolk
3.0012 Fig 2a Wilts
3.0012 Fig 30 Hunts
3.0012 Fig 31 HertsA
3.0012 Fig 4 Northants
3.0012 Fig 63 CambsB
3.0012 Plate XII, 10 Essex
3.0012 Plate XII, 7 Essex
3.0012 Plate XIII, 17 Warks
3.0012 Plate XVI, b Sussex
3.0012 Plate XVI, c Sussex
3.0012 Plate X Lukis Shield
3.0012 TB Shield

3.0013 Balcombe Shield
3.0013 Facsimile at p32 Lancs Lower
3.0013 Facsimile at p32 Lancs Upper
3.0013 Fig 113 NottsC
3.0013 Fig 11d Dorset
3.0013 Fig 11 Beds
3.0013 Fig 12d Dorset
3.0013 Fig 13 Kent
3.0013 Fig 17 HertsB
3.0013 Fig 18 Bucks

3.0013 Fig 1 Raven 1897
3.0013 Fig 20 HertsA
3.0013 Fig 21 Hunts
3.0013 Fig 24 TyssenA
3.0013 Fig 24 TyssenB
3.0013 Fig 41 Berks
3.0013 Fig 53d Wilts
3.0013 Fig 6 Northants
3.0013 Fig 71 Somerset
3.0013 Fig 74c Berks
3.0013 IW Shield
3.0013 Plate XII, 2 Essex
3.0013 Plate XIII, 10 Warks
3.0013 Plate XVI, a Sussex

3.0014 Dawe Medallion
3.0014 Fig 10 Cambs
3.0014 Fig 111 Surrey
3.0014 Fig 11 Hunts
3.0014 Fig 14b HertsB
3.0014 Fig 15 TyssenA
3.0014 Fig 15 TyssenB
3.0014 Fig 16 Bucks
3.0014 Fig 16 Suffolk
3.0014 Fig 17 Fowler 1865
3.0014 Fig 17 HertsA
3.0014 Fig 28 CambsB
3.0014 Fig 49 Devon
3.0014 Fig 8 Kent
3.0014 Fig K7 Oxon
3.0014 Plate IX, 10 Essex
3.0014 Plate I Row 3a Thurlow
3.0014 Plate XI, h Sussex
3.0014 Plate XI Lukis Stop
3.0014 Stop 8 at p52 Norfolk
3.0014 Fig 6 Cornwall

3.0015 Culverden's Shield
3.0015 Fig 197 Surrey
3.0015 Fig 23 Cambs
3.0015 Fig 29a HertsB
3.0015 Fig 29 Hunts
3.0015 Fig 2 Beds
3.0015 Fig 32 Kent
3.0015 Fig 35 HertsA
3.0015 Fig 45 Suffolk
3.0015 Fig 5 Raven 1897
3.0015 Fig 64 CambsB
3.0015 Fig 7 Dorset
3.0015 Fig P8 Oxon
3.0015 Plate 129, 5 Staffs
3.0015 Plate 20a Staffs
3.0015 Plate 21a Staffs
3.0015 Plate I, 5 Walters 1906b
3.0015 Plate XIII, 1 Essex
3.0015 Shield at p191 Durham
3.0015 Plate 5 RCHM II Dorset

3.0016 Fig 20 Beds
3.0016 Fig 28c HertsB
3.0016 Fig 32 HertsA

3.0017 Fig 19 Beds
3.0017 Fig 7d Walters 1906b
3.0017 Fig 8 Walters 1906b
3.0017 Plate XIV, 5 Essex
3.0017 Plate XXXa Hawkins 1938

3.0018 Fig 14 HertsA
3.0018 Fig 183 Surrey
3.0018 Fig 18 Hunts
3.0018 Fig 24 Beds
3.0018 Fig 36 Bucks
3.0018 Fig 3 TyssenA
3.0018 Fig 3 TyssenB
3.0018 Fig 41 Northants
3.0018 Fig 5 Berks
3.0018 Fig 64 Somerset
3.0018 Fig F7 Oxon
3.0018 Landen Shield
3.0018 Plate XIII, e Sussex

3.0019 Arms of Chertsey Abbey
3.0019 Fig 10 Holmes 1987
3.0019 Fig 14 Holmes
3.0019 Fig 15 HertsA
3.0019 Fig 17a Wilts
3.0019 Fig 19 Hants
3.0019 Fig 23a HertsB
3.0019 Fig 28 Northants
3.0019 Fig 37 Bucks
3.0019 Fig 3a Wilts
3.0019 Fig 4 TyssenA
3.0019 Fig 4 TyssenB
3.0019 Fig 67a Dorset
3.0019 Fig 7 Berks
3.0019 Fig 7 VCH Berks
3.0019 Fig 88a Berks
3.0019 Plate at p57 Holmes 1987 (B)
3.0019 Plate at p59 Holmes 1987 (C)
3.0019 Plate IVc Berks
3.0019 Plate XXI, g Sussex

3.0020 Fig 46 Berks
3.0020 Fig 81b Berks
3.0020 Fig E14 Oxon
3.0020 Plate XIX Bucks Rebus Shield

3.0021 Fig 101f Berks
3.0021 Fig 13a HertsB
3.0021 Fig 5 Holmes 1989
3.0021 Fig 6 Berks
3.0021 Fig 8 Hants
3.0021 Fig F9 Oxon
3.0021 Plate IId Holmes 1989

3.0022 Fig 3a Walters 1906b
3.0022 Fig 4c Walters 1906b
3.0022 Fig 65 CambsB
3.0022 Grid Iron
3.0022 Plate XIV, 8 Essex

3.0023 Fig 84 Poppleton
3.0023 Three Lions Passant Shield

3.0024 Fig 6 at p489 Cumb

3.0025 Fig 24 DerbyA
3.0025 Fig 24 DerbyB
3.0025 Fig 28 Poppleton
3.0025 Fig 28 Sheffield

3.0026 Fig 113 Northants

3.0027 Fig 115 Northants

3.0028 Fig 29 Poppleton
3.0028 Fig 90 NottsC

3.0029 Fig 113c Wilts
3.0029 Fig 174d Wilts
3.0029 Fig 38a Dorset
3.0029 ir Medallion

3.0030 Fig 2 Cornwall
3.0030 Fig 6 Devon
3.0030 Fig 6 Somerset
3.0030 Plate XXV, 2 Salop

3.0031 Fig 1 Cornwall
3.0031 Fig 52a Dorset
3.0031 Fig 5 Devon
3.0031 Fig 5 Somerset

3.0032 Fig 19 Lincs

3.0033 Fig 35 Lincs

3.0034 Fig 10 Fowler 1865
3.0034 Fig 131 Lincs
3.0034 Fig 4 at p425 Durham

3.0035 Plate 135a Gloucs

3.0036 Fig C at p292 DerbyB
3.0036 Fig 11 Poppleton
3.0036 Fig 11 Sheffield
3.0036 Fig 23 DerbyA
3.0036 Fig 23 DerbyB
3.0036 Fig 4c NottsB
3.0036 Fig 80 Lincs
3.0036 Fig 89 NottsC

3.0037 Fig 65 Ellacombe
3.0037 Fig 8 Cockey

3.0038 Fig 12 Cockey
3.0038 Fig 43 Ellacombe
3.0038 Fig 43 Walters 1893
3.0038 Fig 4 Witts

3.0039 Fig 11 Cockey
3.0039 Fig 1 Witts
3.0039 Fig 42 Ellacombe
3.0039 Fig 42 Walters 1893
3.0039 Plate 67 Gloucs

3.0040 Fig 147 DerbyA
3.0040 Fig 147 DerbyB
3.0040 Fig 149 NottsC
3.0040 Fig 14b NottsA
3.0040 Fig 40 Poppleton
3.0040 Fig 84 Lincs
3.0040 Fylfot Cross
3.0040 Fylfot D
3.0040 Plate 129, 4 Staffs
3.0040 Plate 129, 8 Staffs
3.0040 Plate 19b, c Staffs
3.0040 Plate 37a Staffs
3.0040 Plate 38a Staffs

3.0041 Fig 110 Ellacombe at Plate X
3.0041 Fig 113 Ellacombe at p12

3.0042 Fig 89 Lincs

3.0043 Fig 121 DerbyB
3.0043 Fig 1b Worcs
3.0043 Fig 2e Worcs
3.0043 Fig 4 Fowler 1865
3.0043 Fig 52 Poppleton
3.0043 Fig 65 Lincs
3.0043 Shield at p205 Durham
3.0043 Shield at p247 Durham
3.0043 Three Bell Shield

3.0044 Fig 119 Lincs
3.0044 Fig 1 NottsC
3.0044 Fig 56 Poppleton
3.0044 Fig 56 Sheffield
3.0044 Plate 129, 7 Staffs
3.0044 Plate 33e Staffs
3.0044 Plate VIII, 5 Cheshire V
3.0044 Shield at p94 Lancs

3.0045 Shield C at p29 RCHM York 3
3.0045 Three Crowns in Pale

3.0046 Shield at p128 Lancs

3.0047 Fig 100 Ellacombe
3.0047 Fig 137 Lincs
3.0047 Fig 20 NottsC
3.0047 Fig 20 Rutland
3.0047 Fig 50 Poppleton
3.0047 Fig 51 Leics
3.0047 Plate X, 7 Warks
3.0047 Shield at p138 Lancs

3.0048 3 Crescents Chevron
3.0048 Fig 11 Fowler 1865
3.0048 Fig 5 at p425 Durham
3.0048 Shield B at p29 RCHM York 3

3.0049 Fig 14 Fowler 1865
3.0049 Fig 2 at p425 Durham
3.0049 Shield A at p29 RCHM York 3

3.0050 Fig 68 Lincs
3.0050 Medallion at p16 Hunts
3.0050 ROS Shield

3.0051 Fig 5 Leics

3.0052 Fig 102 Sheffield
3.0052 Plate XII, e Poppleton

3.0053 Arms of Rouclyff
3.0053 Plate XIXd Poppleton

3.0054 Plate XIXf Poppleton

3.0055 Arms of Hammerton
3.0055 Plate XIXg Poppleton

3.0056 Fig 124 NottsC
3.0056 Kempe Shield
3.0056 Plate XIb Poppleton

3.0057 Fig 25 Hants

3.0058 Plate XIV, 1 Somerset

3.0059 Fig 21 Cornwall
3.0059 Fig 69 Somerset
3.0059 Plate VII, 3 Devon

3.0060 Plate VII, 2 Devon

3.0061 Fig 2 Kent

3.0062 Fig 3 Kent
3.0062 Fig 64 Suffolk
3.0062 Shield 3.4 Cattermole
3.0062 Shield at p81 Norfolk

3.0063 Fig 107 DerbyA

3.0064 Fig 75 Wilts
3.0064 Plate X, 2 Lukis

3.0065 Fig 15 Greenwood
3.0065 Fig 25 DerbyA
3.0065 Fig 25 DerbyB
3.0065 Fig 26 Poppleton
3.0065 Fig 26 Sheffield
3.0065 Fig 91 NottsC

3.0066 Plate XI, 2 Lukis

3.0067 Fig 33 Somerset
3.0067 Plate VIII, 6 Devon (*recte* VII, 6)

3.0068 Fig 23 Somerset

3.0069 Eagle Stamp
3.0069 Fig 11a Wilts
3.0069 Fig 120c Wilts
3.0069 Fig 26 Hants
3.0069 Fig 33 at p509 Devon
3.0069 Fig 4d Wilts
3.0069 Fig 59 Somerset
3.0069 Fig 73c Dorset
3.0069 Plate XI Lukis Eagle Shield

3.0070 Plate XIV, 3 Somerset

3.0071 Plate XX Sussex

3.0072 Plate II, 1 TyssenA

3.0073 Fig 100 DerbyA
3.0073 Fig 100 DerbyB

3.0074 Fig 99 DerbyA
3.0074 Fig 99 DerbyB

3.0075 Fig 31 Poppleton
3.0075 Fig 9 Greenwood
3.0075 Fig B at p52 Fowler 1869
3.0075 Plate IIIa Greenwood
3.0075 Plate XVIb Poppleton

3.0076 Fig 63 Poppleton
3.0076 Fig 63 Sheffield

3.0077 Plate XX, 4 Salop

3.0078 Bett Shield
3.0078 Fig 12 Poppleton
3.0078 Fig 12 Sheffield
3.0078 Fig 14a NottsA
3.0078 Fig 61 NottsC
3.0078 Fig 81 DerbyA
3.0078 Fig 81 DerbyB
3.0078 Plate 129, 3 Staffs
3.0078 Plate 19b, a Staffs
3.0078 Shield at p147 Lancs
3.0078 Shield at p8 Lancs

3.0079 Fig 5 at p489 Cumb

3.0080 Fig 13 Fowler 1865
3.0080 Fig 1 at p425 Durham

3.0081 Fig 16 at p131 Cumb

3.0082 Fig 14 Hants
3.0082 Fig 17 Somerset
3.0082 Fig 61 CambsB
3.0082 Fig 8 Holmes
3.0082 Fig N2 Oxon
3.0082 Hazelwood's Shield
3.0082 Plate XIV, 6 Warks
3.0082 Plate XIX, 1 Bucks
3.0082 St George's Shield

3.0083 Fig 18 Beds

3.0084 Illus A at p7 DerbyB
3.0084 Fig 33 Beds
3.0084 Fig 94 DerbyB

3.0085 Cross Saltire on Shield
3.0085 Fig 106 Ellacombe
3.0085 Fig 124 Lincs
3.0085 Fig 1a NottsA
3.0085 Fig 24 Kent
3.0085 Fig 33 Greenwood
3.0085 Fig 36 Poppleton
3.0085 Fig 36 Sheffield
3.0085 Fig 55 Northants
3.0085 Fig 63 Leics
3.0085 Fig 6 NottsC
3.0085 Fig 70 at p515 Devon
3.0085 Fig 85 DerbyA
3.0085 Fig 85 DerbyB
3.0085 Plate 133, 15 Staffs
3.0085 Plate 27a Staffs
3.0085 Plate 28a Staffs
3.0085 Plate 30a Staffs
3.0085 Plate 31a Staffs
3.0085 Plate 32c Staffs
3.0085 Plate 33a Staffs
3.0085 Plate 33c Staffs
3.0085 Plate 36a Staffs
3.0085 Plate 36d Staffs
3.0085 Plate 45a, c Staffs
3.0085 Plate IIb Greenwood
3.0085 Plate VIII, 2 Cheshire V
3.0085 Plate X, 2 Warks
3.0085 Plate XXa Poppleton
3.0085 Shield at p95 Lancs

3.0086 Fig 11 Lincs
3.0086 Fig 12 Kent
3.0086 Fig 13 TyssenA
3.0086 Fig 13 TyssenB
3.0086 Fig 14 Hunts
3.0086 Fig 15 HertsB
3.0086 Fig 18a HertsA
3.0086 Fig 18 Fowler 1865
3.0086 Fig 19 Cornwall
3.0086 Fig 208c Worcs
3.0086 Fig 27 CambsB
3.0086 Fig 2 Ellacombe 1875
3.0086 Fig 39 Berks
3.0086 Fig 40 Northants
3.0086 Fig 8 Suffolk
3.0086 Fig 9 Cambs
3.0086 Laver-pot Shield
3.0086 Plate I Row 3b Thurlow
3.0086 Plate X, 6 Essex
3.0086 Plate XI, c Sussex
3.0086 Plate XIIa Warks
3.0086 Shield at p11 Eisel
3.0086 Shield 3 at p50 Norfolk

3.0087 Fig 13 Devon
3.0087 Fig 14 Hunts Small Size
3.0087 Fig 16 TyssenA
3.0087 Fig 16 TyssenB
3.0087 Fig 34e Oxon
3.0087 Fig 47c Wilts
3.0087 Fig 6 Kent
3.0087 Fig 9 Suffolk
3.0087 Fig E7 Oxon
3.0087 Fig S7 Oxon
3.0087 Plate XI, 3 Lukis
3.0087 Shield 2 at p206 Durham
3.0087 Small Laver Shield

3.0088 Fig 11 Suffolk
3.0088 Fig 13 Lincs
3.0088 Fig 14 Devon
3.0088 Fig 15 Hunts
3.0088 Fig 17 TyssenA
3.0088 Fig 17 TyssenB
3.0088 Fig 1 Ellacombe 1875
3.0088 Fig 20 Cornwall
3.0088 Fig 29 CambsB
3.0088 Fig 34c Oxon
3.0088 Fig 47d Wilts
3.0088 Fig 75b Dorset
3.0088 Fig S9 Oxon
3.0088 Plate XI, 4 Lukis
3.0088 Plate XI, a Sussex
3.0088 Plate XIIc Warks
3.0088 Shield 1 at p206 Durham

3.0089 Fig 66 Suffolk
3.0089 Plate XXIII, h & n Hawkins 1938

3.0090 Bury Shield
3.0090 Fig 11a HertsB
3.0090 Fig 11 HertsA
3.0090 Fig 20 Cambs
3.0090 Fig 49 CambsB
3.0090 Fig 49 Northants
3.0090 Fig 65 Suffolk
3.0090 HS Shield
3.0090 Plate XVIII, 11 Essex
3.0090 Plate XVII, 4 & 17 Hawkins 1938
3.0090 Plate XVIII, b Hawkins 1938
3.0090 Plate XIX, a, f, k, & p Hawkins 1938
3.0090 Plate XX, a Hawkins 1938
3.0090 Plate XXII, a & f Hawkins 1938
3.0090 Plate XXIII, a & g Hawkins 1938
3.0090 Plate XXIV, g & h Hawkins 1938
3.0090 Plate XXV, a Hawkins 1938
3.0090 Shield at p62 Norfolk

3.0091 Brayser's Sprigged Shield
3.0091 Fig 17 Cambs
3.0091 Fig 39 CambsB
3.0091 Fig 51 Suffolk
3.0091 Fig 68 at Plate X Devon
3.0091 Fig 6 DerbyA
3.0091 Fig 6 Raven 1897
3.0091 Fig 8 Dorset
3.0091 Plate 3c Richards
3.0091 Plate XXVe Hawkins 1938
3.0091 Shield 3.3 Cattermole
3.0091 Shield at p10 Norfolk

3.0092 Fig 52 Suffolk

3.0092 Plate III, 4 Thurlow
3.0092 Shield 3.2 Cattermole
3.0092 Small Ermine Shield
3.0092 Small Shield at p31 Norfolk

3.0093 Fig 50 Suffolk
3.0093 Large Ermine Shield
3.0093 Plate III, 3 Thurlow
3.0093 Shield 3.1 Cattermole
3.0093 Shield at p31 Norfolk

3.0094 Fig 86 Suffolk
3.0094 Norwich City Arms
3.0094 Norwich Arms at p11 Norfolk
3.0094 Shield 3.5 Cattermole

3.0095 Fig 11 NottsC
3.0095 Fig 127 Lincs
3.0095 Fig 14 Northants
3.0095 Fig 16 Fowler 1865
3.0095 Fig 18 Poppleton
3.0095 Fig 18 Sheffield
3.0095 Fig 31 Greenwood
3.0095 Fig 32 Hunts
3.0095 Fig 32 Leics
3.0095 Fig 50 DerbyA
3.0095 Fig 50 DerbyB
3.0095 Fig 9 Rutland
3.0095 Mellours Shield
3.0095 Plate 130, 14 Staffs
3.0095 Plate 57, b Staffs
3.0095 Plate X, 8 Warks
3.0095 Shield at p136 Lancs
3.0095 Shield at p80 Lancs

3.0096 Fig 28d Oxon
3.0096 Fig G2 Oxon
3.0096 Newton Purcell Shield
3.0096 Shield Chevronee

3.0097 Hoath Shield
3.0097 Plain Cross on A Shield

3.0098 Fig 15 Poppleton

3.0099 Fig Bottom p303 Walters 1912

3.0100 Shield of Roger II of Byland

3.0101 Fig 118 DerbyB

3.0102 Fig 28b HertsB

3.0103 Fig 10 Greenwood

3.0104 Plate XXV, b Hawkins 1938

3.0105 Plate XXV, d Hawkins 1938

3.0106 Fig 93 Sheffield

Crowns

4.0001 Burford Crown
4.0001 Fig 20 CambsB
4.0001 Fig 38 Suffolk
4.0001 Fig 7 TyssenA
4.0001 Fig 7 TyssenB
4.0001 Plate I, 10 Essex
4.0001 Plate VIII, b Sussex
4.0001 Plate XI Bucks Crown

4.0002 Fig 125 Lincs
4.0002 Fig 132 DerbyB
4.0002 Fig 88 Northants
4.0002 Fig 8 NottsC

4.0003 Crown at p42 Lancs

4.0004 Crown at p20 Lancs Lower

4.0005 Plate XIX, b Sussex

4.0006 Crown 2 at p50 Norfolk
4.0006 Plate XIIb Warks
4.0006 South Lopham Crown

4.0007 Fig 45 Here

4.0008 Fig 74e Wilts

4.0009 Fig 3 Hunts

4.0010 Fig 56c Wilts

4.0011 Fig 29 Devon

4.0012 Fig 15 Witts
4.0012 Fig 180c Worcs
4.0012 Fig 23 Gloucs
4.0012 Fig 23 Here
4.0012 Fig 33 Ellacombe
4.0012 Fig 39 Somerset
4.0012 Fig 48b Wilts
4.0012 Fig 49b Wilts
4.0012 Fig 94c Wilts
4.0012 Plate 39c Gloucs
4.0012 Plate IIb Salop
4.0012 Plate V, 10 Warks

4.0013 Fig 31 Ellacombe at Plate III
4.0013 Fig 32 at p24 Ellacombe
4.0013 Fig 36 Devon
4.0013 Fig 40b Wilts
4.0013 Fig 42 Somerset
4.0013 Fig 7a Walters 1918
4.0013 Fig 56 Here

4.0014 Fig 31 at p20 Ellacombe
4.0014 Fig 32 at Plate III Ellacombe
4.0014 Fig 32 Devon
4.0014 Fig 32 Walters 1893
4.0014 Fig 44 Somerset

4.0014 Fig 5a Walters 1918
4.0014 Fig 66 Gloucs
4.0014 Fig 6d Walters 1918
4.0014 Fig 90d Dorset
4.0014 Fig 66 Here

4.0015 Box Crown
4.0015 Fig 112a Wilts
4.0015 Fig 134c Wilts
4.0015 Fig 172c Wilts
4.0015 Fig 24a Wilts
4.0015 Fig 30 Ellacombe
4.0015 Fig 30 Walters 1893
4.0015 Fig 37 Devon
4.0015 Fig 3c Walters 1918
4.0015 Fig 43 Somerset
4.0015 Fig 55 Gloucs
4.0015 Fig 55 Here
4.0015 Fig 68d Wilts
4.0015 Fig 70a Wilts

4.0016 Fig 44a DerbyA
4.0016 Fig 44a DerbyB

4.0017 Fig 60 DerbyA
4.0017 Fig 91 Lincs

4.0018 Fig 146 DerbyA
4.0018 Fig 146 DerbyB
4.0018 Fig 32 Greenwood
4.0018 Fig 37 Poppleton

Minuscules

5.0001 Fig 101d Berks
5.0001 Fig 20b Berks
5.0001 Fig 26b Berks
5.0001 Fig 64c Berks
5.0001 Fig 6b Hants
5.0001 Fig 71b Berks
5.0001 Fig 73b Berks
5.0001 Fig Fc Berks
5.0001 Plate 2b Richards
5.0001 Plate at p51 Holmes 1987 (B)
5.0001 Plate IIb Holmes 1989

5.0002 Adstock Minuscules
5.0002 Fig 3c Wilts
5.0002 Fig 47 TyssenB
5.0002 Fig 88b Berks
5.0002 Kimpton Minuscules
5.0002 Plate at p59 Holmes 1987 (A)

5.0003 Fig 21 Hants
5.0003 Fig 44 TyssenB
5.0003 Plate at p19 Holmes 1987 (A)
5.0003 Minuscules Plate XIX Bucks
5.0003 Plate at p57 Holmes 1987 (A)
5.0003 Plate at p60 Holmes 1987 (A)
5.0003 Plate XXI, 1 Sussex
5.0003 Upton Grey Miniscules

5.0004 Fig 11c Dorset
5.0004 Fig 12c Dorset
5.0004 Fig 53c Wilts
5.0004 Fig 74b Berks

5.0005 Plate VIII, 9-10 Essex

5.0006 Fig 1d Worcs
5.0006 Fig 2c Worcs

5.0007 Fig 131b Worcs
5.0007 Grimley Minuscule

5.0008 Fig A at p292 DerbyB
5.0008 Fig 19 Greenwood
5.0008 Fig 3 Poppleton
5.0008 Fig 3 Sheffield
5.0008 Fig 82 Lincs
5.0008 Fig 87 NottsC
5.0008 Plate 37b Staffs
5.0008 Plate 38b Staffs

5.0009 Fig 37c Hants
5.0009 Fig 40 TyssenB
5.0009 Minuscules at p11 Eisel
5.0009 Ninfield Minuscules
5.0009 Plate XI, f2 Sussex

5.0010 Facsimile at p32 Lower Lancs
5.0010 Facsimile at p32 Upper Lancs
5.0010 Fig 21c Oxon
5.0010 Fig 34b Oxon
5.0010 Fig 45 TyssenB
5.0010 Fig Dd Gloucs
5.0010 Fig E Plate at p27 Pipe
5.0010 Illus at p14 Ac CambsB
5.0010 Illus at p14 Ce CambsB
5.0010 Minuscules at p28 Pipe
5.0010 Plate 25a Staffs
5.0010 Plate XIV, c Sussex
5.0010 Plate XLIII, a2, b1, b3, c, f1, & h

5.0011 Fig 67b Dorset

5.0012 Plate 45a & d Staffs

5.0013 Plate 22b Staffs
5.0013 Plate 24b Staffs

5.0014 Fig 28 at p137 Cumb

5.0015 Plate 19a-b Staffs

5.0016 Fig at p313 Draper
5.0016 Illustration at p181 Tyssen 1922

5.0017 Fig 4d Walters 1906b

5.0018 Fig 2c Wilts
5.0018 Fig 3b at p489 Cumb
5.0018 Fig 71b Poppleton

5.0018 Fig 80 Poppleton
5.0018 Plate XIIIc Poppleton

5.0019 Fig 66b DerbyA

5.0020 Fig 68b DerbyA
5.0020 Fig 68b DerbyB
5.0020 Lettering at p178 Lancs

5.0021 Facsimile at p128 Lancs

5.0022 Facsimile at p40 Lancs

5.0023 Fig 48b TyssenB
5.0023 Minuscules Type B Cattermole
5.0023 Plate 3b Richards
5.0023 Plate at p27c Norfolk
5.0023 Plate XIVc Hawkins 1938

5.0024 Fig 24b Wilts
5.0024 Fig 25a Wilts
5.0024 Fig 35c Wilts
5.0024 Fig 3b Walters 1918

5.0025 Fig 155c Wilts
5.0025 Fig 171b Wilts
5.0025 Fig 69c Wilts
5.0025 Fig 70b Wilts
5.0025 Fig 78b Wilts
5.0025 Fig 80c Wilts
5.0025 Fig 86c Wilts
5.0025 Fig 88b Wilts

5.0026 Fig 67b Wilts

5.0027 Facsimile at p94 Lancs
5.0027 Plate 26, c Staffs
5.0027 Plate 27b Staffs
5.0027 Plate 28c Staffs
5.0027 Plate 29 Staffs
5.0027 Plate 30b Staffs
5.0027 Plate 31b Staffs
5.0027 Plate 32b Staffs
5.0027 Plate 33, b & d Staffs
5.0027 Plate 36, b & e Staffs
5.0027 Plate 45a, b Staffs
5.0027 Plate 45b, b Staffs
5.0027 Plate VIII, 1 & 3 Cheshire

5.0028 Fig 23f Dorset
5.0028 Fig 34e Hants
5.0028 Fig 44b2 Dorset
5.0028 Fig 91c Dorset
5.0028 Layer Marney Lettering
5.0028 Plate IV, 15b Essex
5.0028 Plate IX, b3 , 4 Sussex
5.0028 Plate VII, 10b Essex
5.0028 Plate VII, 7b, 8b, 9b, & 10b Essex
5.0028 Plate XIIe Warks

5.0029 Lettering at p215 Cumb

5.0030 Fig 13 Dorset
5.0030 Fig 32b Dorset

5.0031 Fig 46 TyssenB
5.0031 Fig 48b Greenwood
5.0031 Plate X, b Sussex

5.0032 Fig 43 TyssenB
5.0032 Plate XIV, d Sussex
5.0032 Plate XLIII, d , g, & i-j Sussex
5.0032 Chiltington Minuscules

5.0033 Dawe's Minuscule
5.0033 Fig 41 TyssenB
5.0033 Fig 81a Berks
5.0033 Plate XII, a2 Sussex
5.0033 Plate XII, b3 Sussex
5.0033 Plate XII, c3 Sussex

5.0034 Fig 25b Dorset

5.0035 Fig 112b Wilts
5.0035 Fig 132a Wilts
5.0035 Fig 133c Wilts
5.0035 Fig 134b Wilts
5.0035 Fig 172b Wilts
5.0035 Fig 68c Wilts
5.0035 Fig 80b Wilts
5.0035 Plate 5b Gloucs

5.0036 Fig 33c Dorset

5.0037 Fig 54b & c Dorset

5.0038 Fig 48c Dorset

5.0039 Fig 84c Dorset

5.0040 Fig 92c Dorset
5.0040 Plate 20c Staffs
5.0040 Plate 21c Staffs

5.0041 Fig 14c NottsA
5.0041 Fig 4a NottsB
5.0041 Plate 19b, b Staffs

5.0042 Figs 22-4 at p132 Cumb
5.0042 Minuscule at p3 Anon 1893

5.0043 Fig 59c Dorset

5.0044 Fig 74c Wilts

5.0045 Fig 51b Dorset

5.0046 Fig 46 Dorset
5.0046 Fig 8 Devon
5.0046 Fig 8 Somerset
5.0046 Plate IX, 58 Devon
5.0046 Plate IX, 59 Devon
5.0046 Plate IX, 60 Devon

5.0047 Fig 47 Hants

5.0048 Fig 46 Hants

5.0049 Fig 122c Wilts

5.0050 Fig 45b Dorset
5.0050 Fig 71b Dorset
5.0050 Fig 94b Dorset

5.0051 Fig 101b Wilts
5.0051 Fig 109b Wilts
5.0051 Fig 137c Wilts
5.0051 Fig 16b Dorset
5.0051 Fig 18c Dorset
5.0051 Fig 26c Dorset
5.0051 Fig 31 Hants
5.0051 Fig 41c Wilts
5.0051 Fig 92b Wilts
5.0051 Salisbury Minuscules

5.0052 Fig 14c Dorset
5.0052 Fig 65c Dorset

5.0053 Fig 13b Hants
5.0053 Plate Ib Holmes 1989

5.0054 Fig 121c Wilts
5.0054 Fig 124c Worcs
5.0054 Fig 35d Hants

5.0055 Plate XIX, e Sussex
5.0055 Plate XVIII, f-g Sussex
5.0055 Tonne's Smaller Minuscules

5.0056 Plate XVIII, d-e Sussex
5.0056 Tonne's Larger Minuscules

5.0057 Plate XX, 3 Salop

5.0058 Plate XX, 6-7 Salop

5.0059 Plate X, 5 Warks

5.0060 Plate IVb Lincs

5.0061 Plate XV, 1 Warks

5.0062 Plate VI, 3-4 Warks

5.0063 Fig 22b Dorset

5.0064 Fig 228b Worcs
5.0064 Fig 229c Worcs
5.0064 Fig 95b Wilts

5.0065 Fig 148c Wilts
5.0065 Fig 26c Worcs
5.0065 Fig 37c Worcs
5.0065 Fig 47b Wilts

5.0066 Fig 75b Dorset

5.0067 Fig 78e Dorset

5.0068 Fig 87c Dorset

5.0069 Fig 56d Dorset

5.0070 Fig 208b Worcs

5.0071 Plate VI, 1 Warks

5.0072 Facsimile at p20 Lower Lancs

5.0073 Fig 50 Hants

5.0074 Fig 79b Dorset

5.0075 Facsimile at p147 Lancs
5.0075 Facsimile at p42 Lancs

5.0076 Plate XIa Poppleton
5.0076 Thorne Minuscules

5.0077 Plate XIIc Poppleton

5.0078 Fig 13 Greenwood
5.0078 Fig 13 Poppleton

5.0079 Fig 2 Somerset

5.0080 Minuscules Type A Cattermole
5.0080 Plate XXVh Hawkins 1938
5.0080 St John Sepulchre Minuscules
5.0080 Monk's Toft Minuscules

5.0081 Minuscules Type C Cattermole
5.0081 Minuscules at p120 Norfolk

5.0082 Fig 170b Wilts

5.0083 Scarrington Minuscules

5.0084 Dawe's Large Minuscules

5.0085 Dawe's Small Minuscules

5.0086 Burford Minuscules

5.0087 Larger IW Minuscules

5.0088 Smaller IW Minuscules

5.0089 Hove Minuscules

5.0090 Bloxholm Minuscules

5.0091 East Horsley Minuscules

5.0092 Smaller Widford Minuscules

5.0093 Widford Minuscules

5.0094 Fig 38b Greenwood

5.0095 Larger Bury minuscules
5.0095 Plate XX, d Hawkins 1938
5.0095 Plate XXIII, d & k Hawkins 1938
5.0095 Plate XXIV, e & k Hawkins 1938
5.0095 ? Plate XXV, c Hawkins 1938

5.0096 Smaller Bury minuscules
5.0096 Plate XIX, d, j, n, & s Hawkins 1938
5.0096 Plate XXII, e & j Hawkins 1938
5.0096 Plate XXIII, f & m Hawkins 1938

5.0097 Minuscules Plate at p265 DerbyB

Fleur-de-lys

6.0001 Burford Fleur-de-lys
6.0001 Fig 164 Surrey
6.0001 Fig 4 Kent
6.0001 Fig 8 TyssenA
6.0001 Fig 8 TyssenB
6.0001 Fig 9a HertsA
6.0001 Fig 9b HertsB
6.0001 Plate VIII, c Sussex
6.0001 Plate XI Bucks Fleur-de-lys

6.0002 Fig 27 HertsB
6.0002 Fig 3b Walters 1906b
6.0002 Fig 66 CambsB
6.0002 Plate XIV Bucks Upper Fleur

6.0003 Fig 87 Poppleton

6.0004 Fig 109 Sheffield
6.0004 Fig 71 NottsC
6.0004 Fig 76 Lincs

6.0005 Fig 26 Lincs

6.0006 Fig 61 Lincs

6.0007 Fig 91c Dorset

6.0008 Fig 48 Lincs

6.0009 Plate 134, 15 Staffs

6.0010 Fig 233b Worcs
6.0010 Fig 85 Northants
6.0010 Fig A4 Oxon
6.0010 Plate 134, 8 Staffs
6.0010 Plate 16b Staffs
6.0010 Plate 17a Staffs
6.0010 Plate V, 11 Warks
6.0010 Plate VI, 2b Warks
6.0010 Plate XXV, 5 Salop
6.0010 Worcester St Martin Fleur-de-lys

6.0011 Fig D at p292 DerbyB
6.0011 Fig 12 Greenwood
6.0011 Fig 30 DerbyA
6.0011 Fig 30 DerbyB
6.0011 Fig 33 Poppleton
6.0011 Fig 33 Sheffield
6.0011 Fig 4b NottsB
6.0011 Fig 81 Lincs
6.0011 Fig 88 NottsC

6.0012 Fig 126 Worcs
6.0012 Fig 131f Worcs
6.0012 Plate II, 9 Walters 1906a
6.0012 Fig 122b Worcs

6.0013 Fig 12 Devon
6.0013 Fig 12 Somerset
6.0013 Fig 14 Ellacombe

6.0014 Fig 119c Here
6.0014 Fig 2 Devon
6.0014 Fig 71 Ellacombe
6.0014 Fig 87 Here

6.0015 Fig 46 DerbyA
6.0015 Fig 46 DerbyB

6.0016 Fleur-de-lys at p40 Lancs

6.0017 Fig 114 Northants

6.0018 Fig 35c TyssenB
6.0018 Plate VI, d Sussex

6.0019 Fig 10 Devon
6.0019 Fig 10 Somerset
6.0019 Fig 137a Wilts
6.0019 Fig 171c Wilts

6.0020 Fig 95b Dorset

6.0021 Fig 35b Dorset
6.0021 Fig 62c Dorset

6.0022 Fig 57 Hunts

6.0023 Fig 19 Leics
6.0023 Fig 61 Northants

6.0024 Plate XIXb Poppleton

6.0025 Fig 83 NottsC

6.0026 Fig 84 NottsC

6.0027 Fig 115 Sheffield
6.0027 Fig 132 NottsC

6.0028 Fig 148 NottsC

6.0029 Fig 118 Sheffield

6.0030 Budby Fleur
6.0030 Plate at p263c NottsC

6.0031 Sproatley Fleur-de-lys

6.0032 Fig 7 Greenwood

6.0033 Fig 14 Greenwood

Medallions

7.0001 Fig 102 Ellacombe
7.0001 Fig 112 Lincs
7.0001 Fig 34a Greenwood
7.0001 Fig 37 NottsC
7.0001 Fig 3 Bucks
7.0001 Fig 5b HertsB
7.0001 Fig 6 CambsB
7.0001 Fig 6 HertsA
7.0001 Fig 7 Cockey
7.0001 Fig 7 Hunts
7.0001 Fig 8a Poppleton
7.0001 Fig 9 Northants
7.0001 Illus at p14 Bd CambsB
7.0001 Plate 134, 11a Staffs
7.0001 Plate 28d Staffs
7.0001 Plate X, 3a Warks

7.0002 Fig 101 Ellacombe
7.0002 Fig 110 Lincs
7.0002 Fig 2 Bucks
7.0002 Fig 34b Greenwood
7.0002 Fig 36 NottsC
7.0002 Fig 42a Hants
7.0002 Fig 4 CambsB
7.0002 Fig 51 DerbyA
7.0002 Fig 5a HertsB
7.0002 Fig 5 HertsA
7.0002 Fig 6 Cockey
7.0002 Fig 6 Suffolk
7.0002 Fig 7 Northants
7.0002 Fig 8b Poppleton
7.0002 Fig 8 Hunts
7.0002 Head Bottom p254 Devon
7.0002 Illus at p14 Bc CambsB
7.0002 Plate 134, 10 Staffs
7.0002 Plate 134, 11b Staffs
7.0002 Plate 23b Staffs
7.0002 Plate 28e Staffs
7.0002 Plate X, 3b Warks
7.0002 Plate XXVIIIb Hawkins 1938
7.0002 Plate XXIXb Hawkins 1938

7.0003 Fig 10d Worcs
7.0003 Fig 10 CambsB
7.0003 Fig 10 Northants
7.0003 Fig 10 Witts
7.0003 Fig 115c Worcs
7.0003 Fig 134c Worcs
7.0003 Fig 156c Worcs
7.0003 Fig 157c Worcs
7.0003 Fig 18 Rutland
7.0003 Fig 196c Worcs
7.0003 Fig 199c Worcs
7.0003 Fig 239c Worcs
7.0003 Fig 24 Gloucs
7.0003 Fig 24 Here
7.0003 Fig 28 Leics
7.0003 Fig 30 Beds
7.0003 Fig 35 Ellacombe
7.0003 Fig 3c Worcs
7.0003 Fig 4 Cockey
7.0003 Fig 7c Worcs
7.0003 Fig 98c Wilts
7.0003 Fig Cd Gloucs
7.0003 Fig E4 Oxon
7.0003 King at p55 Norfolk
7.0003 King Bottom p253 Devon
7.0003 Plate 96b Gloucs
7.0003 Plate III, 1 Salop
7.0003 Plate V, 13 Warks
7.0003 Plate VI, 2a Warks
7.0003 Fig 201c Worcs

7.0004 Fig 10c Worcs
7.0004 Fig 115d Worcs
7.0004 Fig 11 CambsB
7.0004 Fig 11 Northants
7.0004 Fig 12 Witts
7.0004 Fig 134d Worcs
7.0004 Fig 156d Worcs
7.0004 Fig 157d Worcs
7.0004 Fig 196d Worcs
7.0004 Fig 19 Rutland
7.0004 Fig 239d Worcs
7.0004 Fig 26 Gloucs
7.0004 Fig 26 Here
7.0004 Fig 29 Leics
7.0004 Fig 36 Ellacombe
7.0004 Fig 3d Worcs
7.0004 Fig 52 DerbyA
7.0004 Fig 5 Cockey
7.0004 Fig 7d Worcs
7.0004 Fig 98d Wilts
7.0004 Fig Cc Gloucs
7.0004 Fig E6 Oxon
7.0004 Plate 97b Gloucs
7.0004 Plate I, 3 Walters 1906a
7.0004 Plate III, 3 Salop
7.0004 Plate V, 14 Warks
7.0004 Queen at p55 Norfolk
7.0004 Queen Bottom p253 Devon
7.0004 Fig 201d Worcs

7.0005 Fig 101b Worcs
7.0005 Fig 106 Worcs
7.0005 Fig 238f Worcs
7.0005 Fig 3 Walters 1897
7.0005 Fig 62 Devon
7.0005 Fig 122d Worcs

7.0006 Fig 101e Worcs
7.0006 Fig 112 Worcs
7.0006 Fig 1 Walters 1897
7.0006 Fig 220c Worcs

7.0006 Fig 238d Worcs
7.0006 Fig 63 Devon
7.0006 Plate II, 6 Walters 1906a
7.0006 Plate XXI, 5 Salop
7.0006 Fig 122e Worcs

7.0007 Fig 101f Worcs
7.0007 Fig 109 Worcs
7.0007 Fig 220a Worcs
7.0007 Fig 238e Worcs
7.0007 Fig 2 Walters 1897
7.0007 Fig 61 Devon
7.0007 Plate II, 5 Walters 1906a
7.0007 Plate XXI, 4 Salop

7.0008 Fig 10 Holmes
7.0008 Fig 13b HertsB
7.0008 Fig 13 HertsA
7.0008 Fig 16f Oxon
7.0008 Fig 181 Surrey
7.0008 Fig 1 Berks
7.0008 Fig 1 VCH Berks
7.0008 Fig 23 Beds
7.0008 Fig 25 Somerset
7.0008 Fig 2 Hants
7.0008 Fig 32 Bucks
7.0008 Fig 3 Holmes 1987
7.0008 Fig 52 Northants
7.0008 Fig 56b Dorset
7.0008 Fig 63c Berks
7.0008 Fig 64d Berks
7.0008 Fig 6 TyssenA
7.0008 Fig 6 TyssenB
7.0008 Fig 73c Berks
7.0008 Fig 7 Walters 1897
7.0008 Fig F2 Oxon
7.0008 Fig Fd Berks
7.0008 Plate 2c Richards
7.0008 Plate at p48 Holmes 1987 (D)
7.0008 Plate at p51 Holmes 1987 (D)
7.0008 Plate III Berks Lower, e
7.0008 Plate XIII, a Sussex

7.0009 Fig 101f Berks
7.0009 Fig 33 Bucks
7.0009 Fig 4 Holmes 1989
7.0009 Fig 59 Berks
7.0009 Fig 6 VCH Berks
7.0009 Fig 9 Hants
7.0009 Fig F3 Oxon
7.0009 Plate IIc Holmes 1989
7.0009 Plate XIII, f Sussex

7.0010 Fig 19 Hunts
7.0010 Fig 24a Cambs
7.0010 Fig 60 CambsB

7.0011 Fig 69 Devon

7.0012 Fig 10 Dorset
7.0012 Fig 19 Cambs
7.0012 Fig 41 CambsB
7.0012 Fig 49 DerbyA
7.0012 Fig 62 Suffolk
7.0012 Fig 8 Raven 1897
7.0012 Plate III, 2 Thurlow
7.0012 Plate XVIII, 3 Essex
7.0012 Plate XXV, i Hawkins 1938
7.0012 Plate XXVIb Hawkins 1938
7.0012 Stop 2.4 Cattermole
7.0012 Stop at p33 Norfolk

7.0013 Stop 2.3 Cattermole
7.0013 Fig 48 Suffolk
7.0013 Plate I Row 5b Thurlow
7.0013 Plate XIb Hawkins 1938
7.0013 Potter's Grotesque Face Stop
7.0013 Stop at p26 Norfolk

7.0014 Fig 11 Holmes
7.0014 Fig 16h Oxon
7.0014 Fig 2 Berks
7.0014 Fig 4 Hants
7.0014 Fig 63d Berks
7.0014 Fig 6 Walters 1897
7.0014 Fig F4 Oxon
7.0014 Fig F5 Oxon
7.0014 Trefoil Plate XVI Bucks

7.0015 Fig 52 Bucks

7.0016 Brede Mark
7.0016 Cross 2 at p32 Lower Lancs
7.0016 Fig 105 Somerset
7.0016 Fig 115 NottsC
7.0016 Fig 13 Northants
7.0016 Fig 16 Cambs
7.0016 Fig 185 Surrey
7.0016 Fig 18 HertsB
7.0016 Fig 18 Kent
7.0016 Fig 21d Oxon
7.0016 Fig 21 HertsA
7.0016 Fig 21 Suffolk
7.0016 Fig 229d Worcs
7.0016 Fig 22 Bucks
7.0016 Fig 24 Hunts
7.0016 Fig 25 Cornwall
7.0016 Fig 2 Fowler 1865
7.0016 Fig 2 at p195 Durham
7.0016 Fig 31 Leics
7.0016 Fig 32 TyssenB
7.0016 Fig 33 Lincs
7.0016 Fig 34 CambsB
7.0016 Fig 36 Rutland
7.0016 Fig 39 Devon
7.0016 Fig 44 Berks
7.0016 Fig 64 Poppleton
7.0016 Fig 64 Sheffield
7.0016 Fig 69-2 Ellacombe
7.0016 Fig 8 Beds
7.0016 Fig E3 Oxon
7.0016 Plate XII, 8 Essex
7.0016 Plate XIII, 12 Warks
7.0016 Plate XV, g Sussex

7.0017 Fig 70 CambsB
7.0017 Fig 76 Suffolk
7.0017 Plate I, 2 TyssenA
7.0017 Plate I, 2 TyssenB
7.0017 Plate XVIII, c Sussex

7.0018 Fig 69 CambsB
7.0018 Fig 75 Suffolk
7.0018 Plate I, 3 TyssenA
7.0018 Plate I, 3 TyssenB
7.0018 Plate XVIII, b Sussex

7.0019 Fig 46 Suffolk
7.0019 Plate I Row 5c Thurlow
7.0019 Shield 2.1 Cattermole
7.0019 Stop at p10 Norfolk
7.0019 Three-legged Pot

7.0020 Fig 101a Berks
7.0020 Fig 12 Holmes
7.0020 Fig 163b Surrey
7.0020 Fig 16e Oxon
7.0020 Fig 4 Holmes 1987
7.0020 Fig 5 Hants
7.0020 Fig 63e Berks
7.0020 Fig 64e Berks
7.0020 Fig 6 Holmes 1989
7.0020 Fig 73d Berks
7.0020 Fig Fe Berks
7.0020 Fig Q3 Oxon
7.0020 Groat Stamp
7.0020 Plate at p48 Holmes 1987 (C)
7.0020 Plate at p51 Holmes 1987 (C)
7.0020 Plate IIe Holmes 1989
7.0020 Plate III Berks Lower, a
7.0020 Plate XIII, c Sussex
7.0020 Plate XVII, b Sussex
7.0020 Wokingham Groat

7.0021 Plate XVI, 14 Essex

7.0022 Fig 16 CambsB
7.0022 Fig 80 Leics
7.0022 Fig 80 Northants

7.0023 Fig 20c HertsB
7.0023 Fig 21 CambsB
7.0023 Fig 26 HertsA
7.0023 Fig 32 Suffolk
7.0023 Fig 7 Cambs

7.0024 Evangelist at p8 Hunts
7.0024 Fig 20d HertsB
7.0024 Fig 23 CambsB
7.0024 Fig 27 HertsA
7.0024 Fig 33 Suffolk
7.0024 Fig 6 Cambs

7.0025 Fig 20a HertsB
7.0025 Fig 24 CambsB
7.0025 Fig 25 HertsA
7.0025 Fig 34 Suffolk
7.0025 Fig 4 Cambs

7.0026 Fig 20b HertsB
7.0026 Fig 22 CambsB
7.0026 Fig 24 HertsA
7.0026 Fig 35 Suffolk
7.0026 Fig 5 Cambs

7.0027 Fig 101g Worcs
7.0027 Fig 107 Worcs
7.0027 Fig 220d Worcs
7.0027 Fig 238b Worcs
7.0027 Fig 239e Worcs
7.0027 Fig 64 Devon
7.0027 Plate II, 3 Walters 1906a
7.0027 Plate XXI, 3 Salop
7.0027 Fig 122f Worcs

7.0028 Fig 101d Worcs
7.0028 Fig 110 Worcs
7.0028 Fig 238g Worcs
7.0028 Fig 66 Devon
7.0028 Grimley Lion Stamp
7.0028 Plate II, 7 Walters 1906a
7.0028 Plate XXI, 2 Salop

7.0029 Medallion of Henry VIII
7.0029 Plate XIX, a Sussex
7.0029 Plate XXI, 2 Essex

7.0030 Medallions Frontispiece Kent

7.0031 Fig 69 Lincs

7.0032 Baltasar Medallion
7.0032 Fig 37a Hants
7.0032 Stop Plate XI Lukis

7.0033 Fig 30 Poppleton
7.0033 Fig 8 Greenwood

7.0034 Christ in Glory
7.0034 Plate XIXc Poppleton

7.0035 Crucifixion Medallion
7.0035 Illus at p14 Cb CambsB
7.0035 Plate XV, f Sussex

7.0036 Medallion A at p30 RCHM York 3

7.0037 Fig 75 Leics
7.0037 St Andrew Stamp at p136 Lancs

7.0038 Fig 54 Poppleton
7.0038 St John Baptist Medallion

7.0039 Fig 5d Wilts

7.0040 BVM Medallion
7.0040 Fig 117 Northants
7.0040 Fig 136 Lincs

7.0040 Fig 73 Leics
7.0040 Plate 134, 14 Staffs
7.0040 Plate 36, c Staffs

7.0041 Fig 34 Kent
7.0041 Fig 4a Walters 1906b
7.0041 Fig 5 Walters 1926a
7.0041 Fig 6b Walters 1906b
7.0041 Plate XIV, 7 Essex
7.0041 St John Stamp

7.0042 Fig 133 Lincs
7.0042 Fig 92 Northants
7.0042 Fig 9 Fowler 1865
7.0042 Fig 9 at p425 Durham
7.0042 Medallion C at p30 RCHM York 3
7.0042 Plate XIXe Poppleton
7.0042 Virgin and Child

7.0043 Fig 110 Wilts

7.0044 Fig 16g Oxon
7.0044 Fig 35 Bucks
7.0044 Fig 4 VCH (Berks)
7.0044 Fig K11 Oxon

7.0045 Fig 129b Here

7.0046 Plate 129, 1 Staffs
7.0046 Plate 5, b Staffs

7.0047 Fig 16d Oxon
7.0047 Fig 34 Bucks
7.0047 Fig 3 VCH (Berks)
7.0047 Fig K1 Oxon

7.0048 Fig 97 Lincs

7.0049 Dragon Stamp
7.0049 Fig 127 Worcs
7.0049 Fig 131c Worcs
7.0049 Plate II, 8 Walters 1906a
7.0049? Fig 171c Worcs

7.0050 Dragon at p193 Durham
7.0050 Dragon at p299 Durham
7.0050 Fig 7 Fowler 1865

7.0051 Fig 57 Devon

7.0052 Fig 34 Devon
7.0052 Fig 34 Ellacombe

7.0053 Fig 30 Bucks

7.0054 Fig 98e Wilts

7.0055 Fig 106 DerbyA

7.0056 Fig 174b Wilts

7.0057 Plate XIX, h Sussex

7.0058 Fig 36 Lincs

7.0059 Fig 122 Lincs

7.0060 Fig 107 Lincs
7.0060 Fig 10 NottsC
7.0060 Fig 16 Sheffield
7.0060 Fig 21 Rutland
7.0060 Fig 25 Northants
7.0060 Fig 30 Greenwood
7.0060 Fig 31 Hunts
7.0060 Fig 48 DerbyA
7.0060 Fig 48 DerbyB
7.0060 Fig 52 Leics
7.0060 Plate X, 6 Warks
7.0060 Rose at p136 Lancs
7.0060 Rose at p80 Lancs
7.0060 Square Rose
7.0060 Fig 16 Poppleton

7.0061 Fig 119 DerbyB
7.0061 Fig 22 Rutland
7.0061 Fig 38a Hunts

7.0062 Fig 155e Wilts
7.0062 Fig 24 Ellacombe
7.0062 Fig 60 Somerset
7.0062 Fig 69d Wilts

7.0063 Fig 90 Somerset

7.0064 Fig 87 Somerset

7.0065 Fig 126 Lincs
7.0065 Fig 61 Leics
7.0065 Fig 9 NottsC

7.0066 Fig 46 Leics

7.0067 Fig 53 Poppleton

7.0068 Fig 60 Poppleton

7.0069 Lily in A Pot
7.0069 Medallion B at p30 RCHM York 3

7.0070 Fig 116 DerbyA

7.0071 Fig 115 DerbyA

7.0072 Fig 9 TyssenA
7.0072 Fig 9 TyssenB
7.0072 Plate VI, c Sussex

7.0073 Fig 29 at p137 Cumb
7.0073 Fig 29 at p31 Durham

7.0074 Fig 19 Witts
7.0074 Fig 40a Wilts
7.0074 Fig 41 Ellacombe
7.0074 Fig 41 Walters 1893

7.0074 Fig 57 Somerset
7.0074 Small Ship

7.0075 Fig 5c Walters 1918
7.0075 Fig 6c Walters 1918

7.0076 Fig 35 Devon
7.0076 Fig 57 Glouc s

7.0077 Fig 90a Dorset

7.0078 Plate VIII, 6 Cheshire

7.0079 Arrow
7.0079 Fig 138 Lincs

7.0080 Fig 15 Fowler 1865
7.0080 Fig 38a Greenwood
7.0080 Fig 50 Lincs
7.0080 Fig 6 at p425 Durham
7.0080 Fig 76 NottsC
7.0080 Fig 82 Poppleton

7.0081 Fig 46 Lincs

7.0082 Fig 78 Lincs

7.0083 Fig 31 Kent

7.0084 Fig 200 Surrey
7.0084 Fig 33 Kent

7.0085 Fig 18d Dorset

7.0086 Fig 62 Lincs

7.0087 Fig 66 Ellacombe

7.0088 Fig 4a Warks

7.0089 Plate XX, 2 Salop

7.0090 Plate XVIII, h Sussex

7.0091 Plate XVIII, i Sussex

7.0092 Plate XV, 14 Salop

7.0093 Burham Medallion
7.0093 Fig 106 Northants
7.0093 Medallion Plate VII Surrey

7.0094 Plate XVIII, 1 Essex
7.0094 Stop 2.5 Cattermole

7.0095 IB Monogram p32 Cattermole 1992

7.0096 Mettingham Border

7.0097 Fig 79 Leics

7.0098 Medallion C at p31 Pipe
7.0098 Plate VIa Suffolk
7.0098 Plate XVa Hawkins 1938

7.0099 Medallion B at p31 Pipe
7.0099 Plate VIb Suffolk
7.0099 Plate XVc Hawkins 1938

7.0100 Plate VIc Suffolk

7.0101 Fig 86 Devon

7.0102 Plate XIVb Devon

7.0103 Illus C at p291 Gaythorpe

7.0104 Medallion D at p31 Pipe
7.0104 Plate XVd Hawkins 1938

7.0105 Medallion A at p31 Pipe
7.0105 Plate XVb Hawkins 1938

7.0106 Floral Stamp on p160 Dorset

7.0107 Fig 19 DerbyA

7.0108 Fig 126 NottsC

7.0109 Plate X, a Hawkins 1938

7.0110 Fig 124 DerbyB

Capitals

8.0001 Fig 11b Dorset
8.0001 Fig 3 Ellacombe 1875
8.0001 Fig 66 Northants
8.0001 Fig 67 Northants
8.0001 Fig 69 Devon at p26
8.0001 Fig 70 Devon at p26
8.0001 Fig 71 Devon at p26
8.0001 Fig 76 Devon
8.0001 Fig 77 Devon
8.0001 Fig 78 Devon
8.0001 Plate IVa Lincs
8.0001 Plate XIe Sussex Crowned
8.0001 Plate XIIf Warks
8.0001 Plate XIII Bucks

8.0002 Fig 23b Dorset
8.0002 Fig 34d Hants
8.0002 Fig 44b1 Dorset
8.0002 Fig 91b Dorset
8.0002 Plate VII, 8a, 9a, &10a Essex
8.0002 Plate X, a1 Sussex
8.0002 Plate X, a3 Sussex
8.0002 Plate XI Bucks Upper Set

8.0003 Fig 11b Berks

8.0004 Capitals Plate II Kent
8.0004 Fig 16b Oxon

8.0004 Fig 1b Hants
8.0004 Fig 48a Greenwood
8.0004 Fig 74b Wilts
8.0004 Fig D Plate at p27 Pipe
8.0004 Capitals Plate VIII Surrey
8.0004 Plate at p45 Holmes 1987 (B)
8.0004 Plate VI, 1-3 Essex
8.0004 Plate V, 1-9 Essex
8.0004 Plate X, b1 Sussex
8.0004 Plate XI, 6-14 Warks
8.0004 Plate X Bucks
8.0004 Stephen Norton's Capitals

8.0005 Fig 101c Berks
8.0005 Fig 20a Berks
8.0005 Fig 26a Berks
8.0005 Fig 63a Berks
8.0005 Fig 64b Berks
8.0005 Fig 71a Berks
8.0005 Fig 73a Berks
8.0005 Fig Fb Berks
8.0005 Plate 2a Richards
8.0005 Plate at p51 Holmes 1987 (A)
8.0005 Plate III Berks Lower, c
8.0005 Plate XVI Bucks "W"
8.0005 Plate XV Bucks Capitals
8.0005 Wokingham Crowned Capitals

8.0006 Fig 1c Worcs
8.0006 Fig 2b Worcs
8.0006 Plate XIIIb Poppleton

8.0007 Plate XIII, 3 Essex

8.0008 Fig 57 CambsB
8.0008 Plate XIX Bucks "W"

8.0009 Fig 4c Walters 1906b

8.0010 Fig 52a Wilts
8.0010 Fig 61b Dorset
8.0010 Fig 66b Dorset

8.0011 Fig 12 TyssenA
8.0011 Fig 12 TyssenB
8.0011 Fig 37 TyssenB
8.0011 Plate VII, a Sussex

8.0012 Fig 56b Dorset

8.0013 Fig 95a Dorset

8.0014 Fig 47a Wilts

8.0015 Fig 35 Dorset Initial

8.0016 Fig 21b Dorset
8.0016 Fig 62b Dorset
8.0016 Fig 64b Dorset

8.0017 Fig 36 Dorset

8.0018 Fig 74b Berks

8.0019 Fig 6a Hants
8.0019 Plate at p48 Holmes 1987 (B)
8.0019 Plate XII Surrey

8.0020 Fig 28 Witts
8.0020 Fig 46 Somerset
8.0020 Fig 47b Dorset
8.0020 Fig 47 Somerset
8.0020 Fig 49 Somerset
8.0020 Fig 50 Somerset
8.0020 Plate VI, 3 Devon
8.0020 Figs 16-19 Ellacombe

8.0021 Chitterne Capitals
8.0021 Fig 106b Wilts
8.0021 Fig 138b Worcs
8.0021 Fig 14b Worcs
8.0021 Fig 170b Worcs
8.0021 Fig 196b Worcs
8.0021 Fig 199b Worcs
8.0021 Fig 200b Worcs
8.0021 Fig 218b Worcs
8.0021 Fig 23b Hants
8.0021 Fig 2b Walters 1918
8.0021 Fig 43b Dorset
8.0021 Fig 43b Wilts
8.0021 Fig 4b Worcs
8.0021 Fig 81b Dorset
8.0021 Fig 83b Worcs
8.0021 Fig 84b Worcs
8.0021 John Barber's Capitals
8.0021 Plate 135b Gloucs
8.0021 Plate 136a Gloucs
8.0021 Plate 18, b Staffs
8.0021 Plate 19, b Staffs
8.0021 Plate at p366b Tyssen 1908
8.0021 Plate I, 8-10 Salop
8.0021 Plate VII, 7-9 Warks
8.0021 Plate XIII, 15-16 Warks
8.0021 Plate XIV, 1-4 Essex
8.0021 Fig 201b Worcs

8.0022 Fig 71a Poppleton
8.0022 Leathley Capitals

8.0023 Fig 63 Somerset

8.0024 Plate III Somerset

8.0025 Culverden's Capitals
8.0025 Fig 198 Surrey
8.0025 Plate XIII, 5-7 Essex

8.0026 Fig 12 Hants
8.0026 Plate Ia Holmes 1989
8.0026 Plate IIa Holmes 1989

8.0027 Fig 39b Dorset

8.0028 Fig 228a Worcs

8.0028 Fig 229b Worcs
8.0028 Fig 95a Wilts

8.0029 Almost Barber's Capitals
8.0029 Fig 102b Wilts

8.0030 Fig 37 DerbyB

8.0031 Cringleford Capitals

8.0032 Capitals Plate X, 7-8 Essex
8.0032 Fig 2b Wilts
8.0032 Fig 34a Oxon
8.0032 Fig 75a Dorset
8.0032 Plate X, 7-8 Essex

8.0033 Fig 42b Hants
8.0033 Plate IV Bucks Upper Set

8.0034 Fig 29 Bucks
8.0034 Plate XI, 8-12 Essex
8.0034 Plate XIII, 7-9 Warks
8.0034 Plate XIV, a Sussex
8.0034 Powdrell Capitals
8.0034 Shipbourne Capitals

8.0035 Fig 42a TyssenB
8.0035 Hove Capitals
8.0035 Plate XIV Bucks Upper Set
8.0035 Plate XVI, e2 Sussex

8.0036 Fig 118b Here
8.0036 Fig 36a TyssenB
8.0036 Fig 69b Berks
8.0036 Plate III, a2 Sussex
8.0036 Plate VIIb Salop
8.0036 Recercle Lettering

8.0037 Fig 28b Oxon
8.0037 Plate VI Bucks Upper Set

8.0038 Plate VIII Bucks Lower Set

8.0039 Fig 40b Hants
8.0039 Fig 96a Berks
8.0039 Fig 97b Berks

8.0040 Capitals at p11 Eisel
8.0040 Capitals at p28 Pipe
8.0040 Capitals Plate XII Warks Uncrowned
8.0040 Fig 80b Berks
8.0040 Fig B at p310 Draper
8.0040 Plate VIII, 1-4 Essex
8.0040 Plate X, 5 Essex
8.0040 Plate XI, e Sussex
8.0040 Plate XII, c2 Sussex

8.0041 Fig 98a Berks
8.0041 Fig at p311 Draper
8.0041 Plate II, 2-8 Essex

8.0042 Plate VI Bucks Lower Set

8.0043 Buscot Capitals
8.0043 Fig 1b Walters 1918
8.0043 Plate 142b Gloucs

8.0044 Fig 53 Bucks

8.0045 Fig 20 Hants
8.0045 Fig 89 Dorset
8.0045 Plate IVa Berks
8.0045 Plate XXI, a Sussex
8.0045 Plate XX Bucks Upper Set

8.0046 Fig 13a Hants
8.0046 Hazelwood's Capitals
8.0046 Plate XIV, 1-5 Warks
8.0046 Plate XVIII Bucks
8.0046 Capitals Plate XVII Bucks

8.0047 Fig G Berks

8.0048 Plate III Bucks
8.0048 Plate I Surrey

8.0049 Plate VII Bucks

8.0050 Fig 103b Berks
8.0050 Fig 51 TyssenB
8.0050 Ford Capitals
8.0050 Plate III, 1-7 Essex
8.0050 Plate IV, c Sussex
8.0050 Plate IX Surrey
8.0050 Plate V, a Sussex

8.0051 Fig 121b Worcs
8.0051 Fig 124b Worcs
8.0051 Fig 13 Bucks
8.0051 Fig 171 Surrey
8.0051 Fig 35a Hants
8.0051 Fig 54 Ellacombe
8.0051 Fig 55 Ellacombe
8.0051 Plate IX, b2 Sussex
8.0051 Plate VII, 7a Essex
8.0051 Plate X, f Sussex
8.0051 Plate X, d Sussex
8.0051 Plate XI, 4-5 Warks
8.0051 Plate XI Bucks Lower Set
8.0051 Stoke D'Abernon Capitals

8.0052 Capitals Plate V Bucks
8.0052 Capitals Type F Cattermole
8.0052 Derby's Capitals
8.0052 Plate IV, 44-9 Ellacombe
8.0052 Fig 10b Worcs
8.0052 Fig 115b Worcs
8.0052 Fig 134b Worcs
8.0052 Fig 156b Worcs
8.0052 Fig 157b Worcs
8.0052 Fig 239b Worcs
8.0052 Fig 35b TyssenB
8.0052 Fig 3b Oxon
8.0052 Fig 3b Worcs

8.0052 Fig 7b Worcs
8.0052 Fig 98b Wilts
8.0052 Fig Cb Gloucs
8.0052 Illus Bb at p14 CambsB
8.0052 Letchworth Capitals
8.0052 Plate 137b Gloucs
8.0052 Plate 96a Gloucs
8.0052 Plate 97a Gloucs
8.0052 Plate at p31 Cattermole
8.0052 Plate I, 4-12 Walters 1906a
8.0052 Plate III, 4-9 Salop
8.0052 Plate IV Bucks Lower Set
8.0052 Plate IX, 2-7 Salop
8.0052 Plate V, 15-24 Warks
8.0052 Plate VI, e-f Sussex
8.0052 Plate X Surrey Half-size
8.0052 Plate XXVIIId Hawkins 1938

8.0053 Burford's Large Capitals
8.0053 Fig 226b Worcs
8.0053 Fig 227 Worcs
8.0053 Illus at p14 Cd CambsB
8.0053 Plate 63 Gloucs
8.0053 Plate 64 Gloucs
8.0053 Plate IX Bucks
8.0053 Plate VI, 6 Essex
8.0053 Plate XI, 9-14 Warks Uncrowned
8.0053 Plate XIII Surrey
8.0053 Stephen Norton's Caps Uncrown

8.0054 Fig E Berks

8.0055 Capitals Plate III Kent
8.0055 Fig 166 Surrey
8.0055 Fig 167 Surrey
8.0055 Fig 225b Worcs
8.0055 Fig 33c Hants
8.0055 Fig 9 Bucks
8.0055 Fig Dc Gloucs
8.0055 Plate IV, 1-8 Essex
8.0055 Plate IV, 11, 14, and 15a Essex
8.0055 Plate VIII, d Sussex
8.0055 William Burford Capitals

8.0056 Capitals at p32 Lower Lancs
8.0056 Capitals at p32 Upper Lancs
8.0056 Capitals Plate XII Bucks
8.0056 Fig 12b Dorset
8.0056 Fig 21b Oxon
8.0056 Fig 74a Berks
8.0056 Fig 79a Dorset
8.0056 Illus at p14 Ab CambsB
8.0056 Plate XI, 1-7 Essex
8.0056 Plate XIII, 2-6 Warks
8.0056 Plate XIV, b Sussex

8.0057 Fig D Berks
8.0057 Plate LXXI, 13 Walters 1926b

8.0058 Capitals Plate at p265 DerbyB

8.0059 Capitals at p216 Cattermole
8.0059 Capitals at p82-3 Norfolk
8.0059 Crostwight Capitals
8.0059 Fig 195-7 Lincs

8.0060 Capitals at p201 Norfolk
8.0060 Plate XVI, 1-13 Essex
8.0060 Wood Rising Lettering

8.0061 Plate II, 15-18 Warks

8.0062 Plate II, 11-12 Warks

8.0063 Fig 128b Here

8.0064 Plate IV Warks Lower 2 Lines

8.0065 Fig 175 Lincs

8.0066 Fig 190 Lincs

8.0067 Fig 37b Hants

8.0068 Fig 232b Worcs
8.0068 Worcester St Andrew Lettering

8.0069 Fig 106b Here

8.0070 Fig 25b Worcs
8.0070 Fig 30b Worcs

8.0071 Plate XIII Lincs
8.0071 Plate XII Lincs

8.0072 Fig 208a Worcs

8.0073 Fig 169b Worcs

8.0074 Plate I Bucks Bottom Set

8.0075 Fig 117-31 DerbyA (unpubl)
8.0075 Illus B at p47 DerbyB
8.0075 Plate VIIIb Warks
8.0075 Capitals Plate 36 Walters 1908 top

8.0076 Capitals at p80 Lancs Lower
8.0076 Fig 178 Lincs
8.0076 Fig 73 DerbyA
8.0076 Fig 73 DerbyB
8.0076 Plate 57, a Staffs
8.0076 Plate X, 10-11 Warks
8.0076 Fig 2 Raven 1902

8.0077 Fig 101c Worcs
8.0077 Fig 105 Worcs
8.0077 Fig 108 Worcs
8.0077 Fig 111 Worcs
8.0077 Fig 131c Worcs
8.0077 Fig 220b Worcs
8.0077 Fig 238c Worcs
8.0077 Plate II, 4 Walters 1906a
8.0077 Plate XXI, 6-11 Salop
8.0077 Fig 122c Worcs

8.0077 Fig 171b Worcs

8.0078 Fig 159b Worcs
8.0078 Fig 160b Worcs
8.0078 Fig 40b Worcs
8.0078 Fig 41b Worcs
8.0078 Fig 44b Worcs
8.0078 Plate IV, 2-7 Salop
8.0078 Plate IX, 9-11 Salop

8.0079 Plate IX Lincs
8.0079 Plate XII Lincs
8.0079 Plate XI Lincs
8.0079 Plate X Lincs
8.0079 Capitals Plate 36 Walters 1908 bottom

8.0080 Fig 192 Lincs
8.0080 Fig 193 Lincs
8.0080 Fig 70 Lincs
8.0080 Fig 71a Lincs
8.0080 Fig 71 Lincs

8.0081 Fig 48b Worcs
8.0081 Fig 52a Worcs
8.0081 Fig 53 Worcs
8.0081 Plate II, 2-8 Warks

8.0082 Plate 134a Gloucs
8.0082 Plate 6 Gloucs
8.0082 Plate IIIb Warks
8.0082 Plate IV Warks Upper Line

8.0083 Plate XIX, 4-7 Essex
8.0083 Plate XX, c Hawkins 1938

8.0084 Fig 48e Worcs
8.0084 Hendley's Capitals
8.0084 Plate 39a Gloucs

8.0085 Fig 154b Worcs
8.0085 Lindridge Capitals
8.0085 Plate VI, 6b-7 Warks

8.0086 Capitals Plate XV Essex
8.0086 Fig 2c Walters 1906b
8.0086 Fig 6a Walters 1906b
8.0086 Fig 7b Walters 1906b
8.0086 Plate XVII, a Sussex
8.0086 Plate XXXc Hawkins 1938

8.0087 Fig 39b Hants

8.0088 Allington Capitals
8.0088 Fig 138c Worcs
8.0088 Fig 14c Worcs
8.0088 Fig 170c Worcs
8.0088 Fig 218c Worcs
8.0088 Fig 4c Wilts
8.0088 Fig 4c Worcs
8.0088 Fig 83c Worcs
8.0088 Fig 84c Worcs
8.0088 John Barber's Capitals Uncrowned
8.0088 Plate 18, c Staffs
8.0088 Plate 19, c Staffs
8.0088 Plate I, 5-7 Salop
8.0088 Plate VII, 5-6 Warks
8.0088 Fig 200c Worcs

8.0089 Fig 76b Worcs

8.0090 Fig 180b Worcs

8.0091 Fig 129c Here

8.0092 Plate IV, 12 Essex

8.0093 Capitals at p138 Lancs Upper set
8.0093 Capitals at p138 Lancs Bottom set
8.0093 Plate 26, b Staffs
8.0093 Plate X, 4 Warks

8.0094 Capitals at p252 DerbyB
8.0094 Fig 180-3 Lincs
8.0094 Plate VIIIb Poppleton
8.0094 Plate 10, a Staffs
8.0094 Plate 6, c Staffs
8.0094 Plate 7, b Staffs
8.0094 Plate 8, c Staffs
8.0094 Plate 9, b Staffs
8.0094 Plate IIIb Greenwood
8.0094 Plate XXIII, 2-7 Salop

8.0095 Plate 34, b Staffs

8.0096 Plate 4, b Staffs
8.0096 Plate 5, a Staffs

8.0097 Plate 25, b Staffs

8.0098 Plate 19, d Staffs

8.0099 Fig 143b Worcs
8.0099 Fig 233c Worcs
8.0099 Plate 13b Staffs
8.0099 Plate 14 Staffs
8.0099 Plate 15 Staffs
8.0099 Plate 16a Staffs
8.0099 Plate 17b Staffs
8.0099 Plate 23a Staffs
8.0099 Plate 32a Staffs
8.0099 Plate VII, 11-15 Warks
8.0099 Plate VII, 1 Warks
8.0099 Plate X, 4-6 Salop
8.0099 Plate XX, 9-11 Salop
8.0099 Plate XXV, 6-9 Salop
8.0099 Wrockwardine Capitals

8.0100 Plate 1, b Staffs
8.0100 Plate 134, 1-4 Staffs
8.0100 Plate 2 Staffs
8.0100 Plate 3 Staffs

8.0101 Widford Capitals

8.0102 Fig 4b Walters 1918

8.0103 Fig 7b Walters 1918

8.0104 Fig 7 at p493 Cumb
8.0104 Fig 9 at p493 Cumb

8.0105 Fig 27 at p137 Cumb

8.0106 Lettering at p165 Cumb

8.0107 Plate 124 Glouc s

8.0108 Kimpton Capitals

8.0109 Fig 8b Fowler 1865
8.0109 Heighington Capitals

8.0110 Plate 174 Glouc s

8.0111 Fig 52-4 Somerset
8.0111 Fig 75-7 Ellacombe

8.0112 Capitals Plate II Somerset
8.0112 Fig 21-3 Ellacombe at p17
8.0112 Fig 48c Wilts
8.0112 Fig 49c Wilts
8.0112 Fig 94b Wilts
8.0112 Plate IIc Salop
8.0112 Plate V, 2-9 Warks
8.0112 Plate VI Devon
8.0112 Sapperton Lettering

8.0113 Fig 36b Hants
8.0113 Fig 96 Dorset
8.0113 Lettering Bottom p26 Kent
8.0113 Plate IX, 1-9 & 11 Essex
8.0113 Plate XI, f1 Sussex
8.0113 Plate XII, a2 Sussex

8.0114 Cracked 'M'
8.0114 Fig 20 Ellacombe at Plate II
8.0114 Fig 24 Ellacombe at p17

8.0115 Capitals at p128 Lancs Upper

8.0116 Fig 48c Wilts
8.0116 Fig 49c Wilts
8.0116 Fig 94b Wilts
8.0116 Intact 'M'

8.0117 Fig 25a Dorset

8.0118 Plate Ib Warks

8.0119 Plate X, 2 Salop

8.0120 Fig 10a NottsB
8.0120 Fledborough Capitals

8.0121 Fig 85c Dorset

8.0122 Fig 35 Somerset

8.0123 Fig 92b Dorset
8.0123 Plate 20b Staffs
8.0123 Plate 21b Staffs

8.0124 Fig 17 Hants
8.0124 Wokingham Capitals

8.0125 Fig 50 TyssenB
8.0125 Plate III, b Sussex

8.0126 Fig 49b Dorset

8.0127 Fig 39a TyssenB
8.0127 Plate VII, b2 Sussex

8.0128 Fig 66a DerbyA

8.0129 Fig 41b Wilts

8.0130 Fig 73b Dorset

8.0131 Plate IX, 7-8 Warks

8.0132 Fig 16a Hants

8.0133 Fig 82 Dorset

8.0134 Fig 31b Dorset

8.0135 Illus B p291 Gaythorpe

8.0136 Capitals at p40 Lancs

8.0137 Capitals at p42 Lancs

8.0138 Plate XI, 148-51 Surrey

8.0139 Plate III, 10b Salop

8.0140 Fig 11b NottsA

8.0141 Fig 29b Wilts
8.0141 Fig 29c Dorset

8.0142 Fig 100b Wilts
8.0142 Fig 101a Wilts
8.0142 Fig 10b Wilts
8.0142 Fig 113a Wilts
8.0142 Fig 118b Wilts
8.0142 Fig 11c Wilts
8.0142 Fig 120b Wilts
8.0142 Fig 136b Wilts
8.0142 Fig 137b Wilts
8.0142 Fig 139b Wilts
8.0142 Fig 174a Wilts
8.0142 Fig 175b Wilts
8.0142 Fig 176b Wilts
8.0142 Fig 179b Wilts
8.0142 Fig 17 Dorset
8.0142 Fig 18b Dorset

8.0142 Fig 26b Dorset
8.0142 Fig 30 Chitty
8.0142 Fig 30 Hants
8.0142 Fig 32b Wilts
8.0142 Fig 33b Dorset
8.0142 Fig 38b Dorset
8.0142 Fig 38 Wilts
8.0142 Fig 44b Wilts
8.0142 Fig 45b Wilts
8.0142 Fig 65b Dorset
8.0142 Fig 65b Wilts
8.0142 Fig 71b Dorset
8.0142 Fig 86c Dorset
8.0142 Fig 9 Wilts
8.0142 Plate VII, c2 Sussex
8.0142 Salisbury Capitals

8.0143 Fig 116 Northants

8.0144 Fig 45 Hants
8.0144 Fig 60b Dorset

8.0145 Capitals top p30 Kent
8.0145 Stansted Capitals

8.0146 Fig 73e Dorset

8.0147 Fig 78d Dorset

8.0148 Fig 43b Hants

8.0149 Capitals at p54 Norfolk
8.0149 Fig 15-16 Holmes 1987
8.0149 Fig 32 Hants
8.0149 Plate at p33 Holmes 1987
8.0149 Plate II, 17-20 Essex
8.0149 Plate I Rows 1-2 Thurlow
8.0149 Plate VI Surrey

8.0150 Plate XV, 2-8 & 10-12 Salop

8.0151 Stanwick Capitals

8.0152 Fig 14b Dorset

8.0153 Fig 17 Oxon
8.0153 Fig 48b Hants
8.0153 Robert Norton's Capitals

8.0154 Capitals Plate at p14 Pipe
8.0154 Capitals Type C Cattermole
8.0154 Fundenhall Capitals
8.0154 Plate at p27b Norfolk
8.0154 Plate XVII, 2-5 Essex
8.0154 Plate XXIXd Hawkins 1938
8.0154 Potter's Small Capitals

8.0155 Plate II, 9-15 Essex
8.0155 Capitals Plate II Surrey

8.0156 Plate XIX, 2-3 & 8-9 Salop

8.0157 Illus at p282 Walters 1912
8.0157 Plate I, 11-19 Essex
8.0157 Plate V Surrey

8.0158 Fig 9b Oxon
8.0158 Plate 126b Gloucs

8.0159 Fig 93b Dorset

8.0160 Fig 16b Hants
8.0160 Fig 18 Hants

8.0161 Fig at p187 Walters 1912
8.0161 Plate VIII Bucks Upper Set

8.0162 Fig 38 TyssenB
8.0162 Plate V, c Sussex

8.0163 Burlingham Capitals
8.0163 Capitals at p80 Norfolk
8.0163 Capitals Type G Cattermole
8.0163 Plate I Kent Capitals
8.0163 Plate V Suffolk

8.0164 Fig 90c Dorset

8.0165 Capitals at p203 Durham Upper Set

8.0166 Fig 171d Wilts

8.0167 Capitals at p203 Durham Lower Set

8.0168 Fig 76b Dorset

8.0169 Alnwick Lettering
8.0169 Lettering at p79 Durham

8.0170 Facsimile at p141 Cumb
8.0170 Lettering at p196 Durham

8.0171 Capitals at p194 DerbyB
8.0171 Carlisle Cathedral Capitals
8.0171 Fig 7a at p425 Durham
8.0171 Lettering at p139 Cumb
8.0171 Lettering at p294 Durham

8.0172 Ayleston Capitals
8.0172 Fig 66 Poppleton
8.0172 Fig 84-5 Leics
8.0172 Fig 88 Lincs
8.0172 Plate 11b Staffs
8.0172 Plate 12a Staffs
8.0172 Plate VII, 17-19 Warks

8.0173 Plate XIX, 4-7 Salop

8.0174 Fig 49b TyssenB
8.0174 Plate III, c2 Sussex
8.0174 Plate IV, a2 Sussex
8.0174 Plate IV Surrey

8.0175 Fig 3a at p489 Cumb

8.0176 Capitals at p128 Lancs

8.0177 Micklegate Capitals

8.0178 Capitals at p20 Lancs Upper Set

8.0179 Capitals at p80 Lancs Bottom Set

8.0180 Plate at p208a DerbyB

8.0181 Lettering at p94 Lancs
8.0181 Fig 1b NottsB
8.0181 Plate 28b Staffs

8.0182 Plate XXV, 1 & 3 Salop

8.0183 Facsimile at p132 Lancs Upper Set
8.0183 Plate IVb Poppleton
8.0183 Plate 129, 2a Staffs
8.0183 Plate 6a Staffs
8.0183 Plate 7a Staffs
8.0183 Plate 8a Staffs

8.0184 Cawthorne Capitals
8.0184 Melton Mowbray Capitals
8.0184 Plate 26, a Staffs
8.0184 Plate 45a, a Staffs
8.0184 Plate 45b, a Staffs
8.0184 Plate IIa Greenwood
8.0184 Plate XXb Poppleton
8.0184 Series C Lettering Sheffield
8.0184 Type C Capitals NottsC

8.0185 Plate 35, b Staffs
8.0185 Plate IX, 2-5 Warks

8.0186 Fig A at p52 Fowler 1869
8.0186 Plate 22a Staffs
8.0186 Plate 24c Staffs
8.0186 Plate XVIa Poppleton

8.0187 Capitals with Cable Border
8.0187 Fig 15 DerbyA
8.0187 Plate 24a Staffs
8.0187 Plate 37c Staffs
8.0187 Plate 38c Staffs

8.0188 Fig 12 at p493 Cumb
8.0188 Fig 14 at p493 Cumb

8.0189 Fig 30b Dorset

8.0190 Fig 52d Dorset

8.0191 Fig 33b Wilts
8.0191 Fig 41b Hants
8.0191 Fig 55b Dorset
8.0191 Fig 55b Wilts
8.0191 Plate III, 8b, 9, & 12 Essex
8.0191 Plate VI, h-k Sussex

8.0192 Plate XIXa Poppleton

8.0193 Lettering at p506 Cumb
8.0193 Lettering at p518 Cumb

8.0194 Lettering at p210-1 Cumb

8.0195 Fig 83b Wilts
8.0195 Fig 91b Wilts

8.0196 Plate LXXVIII Sussex

8.0197 Fig 86 Dorset

8.0198 Fig 44b Hants

8.0199 Fig 122b Wilts

8.0200 Capitals at p284 Walters 1912
8.0200 Fig 3b Warks

8.0201 Fig 53b Wilts

8.0202 Plate VIIIb Salop

8.0203 Capitals at p185 Walters 1912
8.0203 Fig 2b Warks
8.0203 Fig 69b Dorset
8.0203 Magdalen Laver Capitals
8.0203 Plate I, 1-8 Essex
8.0203 Plate IVb Hawkins 1938

8.0204 Fig 28b Dorset

8.0205 Fig 41 Dorset

8.0206 Fig 63c Dorset

8.0207 Fig 83b Dorset

8.0208 Capitals at p80 Lancs Upper Set
8.0208 Fig 68a DerbyA
8.0208 Fig 68a DerbyB

8.0209 Fig 63d Dorset

8.0210 Fig 30 at p138 Cumb
8.0210 Fig 30 Durham
8.0210 Illus at p31 Durham

8.0211 Plate XIX Bucks

8.0212 Capitals Plate XX Bucks Upper Set
8.0212 Fig 3b Wilts

8.0213 Patney Capitals

8.0214 Fig 38b Bell *et al* 1987

8.0215 Figs 17-20 at p131 Cumb

8.0216 Capitals at p13 Pipe

8.0216 Plate III Surrey Capitals
8.0216 Plate I Suffolk
8.0216 Plate III Hawkins 1938

8.0217 Lettering Fig 52 Oxon

8.0218 Fig 68b Dorset

8.0219 'HD' Lettering
8.0219 Capitals at p178 Lancs
8.0219 Fig 12 Fowler 1865
8.0219 Fig 37-8 Leics
8.0219 Fig 3 at p425 Durham
8.0219 Fig 70 DerbyA
8.0219 Fig 71 DerbyA

8.0220 Capitals at p92 Lancs

8.0221 Fig 34 TyssenB
8.0221 Plate V, b & d Sussex

8.0222 Figs 51-3 CambsB
8.0222 Figs 69-71 Suffolk
8.0222 Plate XIX, 1-3 Essex
8.0222 Plate XVIII, d Hawkins 1938
8.0222 Plate XX b, i, m, & r Hawkins 1938
8.0222 Plate XXII, d & i Hawkins 1938
8.0222 Plate XXIV, b Hawkins 1938

8.0223 Fig 17b Wilts

8.0224 Plate XI, 152-9 Surrey

8.0225 Fig 40c Wilts
8.0225 Fig 5b Walters 1918
8.0225 Fig 68b Wilts

8.0226 Enlarged Tortworth Capitals
8.0226 Fig 107b Wilts
8.0226 Fig 145b Wilts
8.0226 Fig 155b Wilts
8.0226 Fig 69b Wilts
8.0226 Fig 6a Wilts
8.0226 Fig 77b Wilts
8.0226 Fig 86b Wilts
8.0226 Fig 99a Wilts
8.0226 Plate 80b Glouces
8.0226 Swindon Capitals
8.0226 Yate Capitals

8.0227 Fig 70 Somerset
8.0227 Plate IX, 75-8 Somerset
8.0227 Plate XIVa Devon

8.0228 Fig 121a Wilts

8.0229 Fig 34 Dorset

8.0230 Fig 35a Dorset
8.0230 Fig 62b Dorset

8.0231 Ashley Capitals
8.0231 Fig 56b Wilts
8.0231 Fig 5b Wilts

8.0232 'D' Plate XIX Bucks

8.0233 Fig 42b Wilts
8.0233 Fig 49b Hants

8.0234 Fig 148b Wilts
8.0234 Fig 156a Wilts
8.0234 Fig 26b Worcs
8.0234 Fig 37b Worcs
8.0234 Tollard Royal Capitals

8.0235 Fig 17 CambsB
8.0235 Fig 18 CambsB
8.0235 Fig 4 Suffolk
8.0235 Fig 5 Suffolk

8.0236 Fig 119b Here
8.0236 Fig 35b Wilts
8.0236 Fig 6a Walters 1918
8.0236 Plate 3 Glouces
8.0236 Tortworth Capitals

8.0237 Capitals Type B Cattermole
8.0237 Fig 30 CambsB
8.0237 Fig 42 CambsB
8.0237 Fig 47 CambsB
8.0237 Fig 55 Suffolk
8.0237 Fig 84a Dorset
8.0237 Plate 3a Richards
8.0237 Plate X, 70-74 Devon
8.0237 Plate XVII, 6 Essex
8.0237 Potter's Large Capitals
8.0237 Plate Xc Hawkins 1938
8.0237 Plate XIc Hawkins 1938

8.0238 John of York's Capitals
8.0238 Plate X, 1 Warks
8.0238 Sproxton Capitals

8.0239 Fig 87b Dorset

8.0240 Fig 69 DerbyA

8.0241 Fig 11 Oxon
8.0241 Plate II Bucks
8.0241 Plate I Bucks Upper Set

8.0242 Capitals Plate VII Surrey
8.0242 Fig 33b TyssenB
8.0242 Plate IV, b2 Sussex

8.0243 Brayser's Larger Capitals
8.0243 Capitals Type D Cattermole

8.0244 Barford Capitals
8.0244 Capitals Type A Cattermole
8.0244 Plate I Row 4b Thurlow

8.0245 Brayser's Smaller Capitals

8.0245 Capitals Type E Cattermole
8.0245 Fig 48a TyssenB
8.0245 Plate XXVg Hawkins 1938
8.0245 Plate XXVId Hawkins 1938

8.0246 Capitals Type I Cattermole
8.0246 Capitals Type J Cattermole
8.0246 Ellough Capitals
8.0246 Plate VIII Hawkins 1938

8.0247 Capitals Type H Cattermole
8.0247 Plate XXVII, 4-9 Essex Small
8.0247 Plate XIIc Hawkins 1938
8.0247 Plate XIII Hawkins 1938
8.0247 Plate XIa Hawkins 1938
8.0247 Plate XIVb Hawkins 1938

8.0248 Larger 'W' Plate XIX Bucks

8.0249 Dawe's Large Capitals

8.0250 Barleston Capitals

8.0251 Illus C at p7 DerbyB

8.0252 Barnetby-le-wold Capitals

8.0253 Pittington Capitals

8.0254 Manton Capitals

8.0255 Swinstead Capitals

8.0256 Wispington Capitals

8.0257 Finmere Capitals

8.0258 Bexwell Capitals
8.0258 Lettering at p12 Pipe
8.0258 Plate 1 Richards
8.0258 Plate XXVIIb Hawkins 1938

8.0259 Capitals Plate XXVII Bucks

8.0260 Fig B at p405 Elphick 1960

8.0261 'M' Fig 101 Devon

8.0262 Facsimile B at p132 Lancs Lower Set
8.0262 Illus B at p22 Walters 1912

8.0263 Fig 70b Dorset

8.0264 Plate XIIb Poppleton

8.0265 Budby Capitals
8.0265 Plate at p263 NottsC

8.0266 Type B Capitals NottsC

8.0267 Type D Capitals NottsC

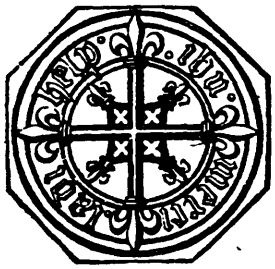
8.0268 Plate XXI, 4 Hawkins 1938

8.0269 Plate II, a Hawkins 1938

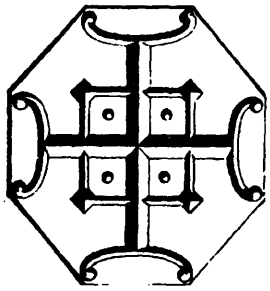
8.0270 Plate Vb Hawkins 1938
8.0270 Plate VIa Hawkins 1938

8.0271 Plate VIIc Hawkins 1938

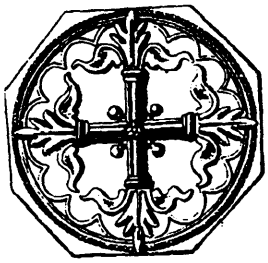
8.0272 Plate IXb Hawkins 1938



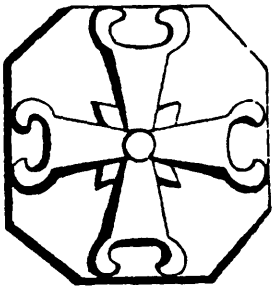
1.0001



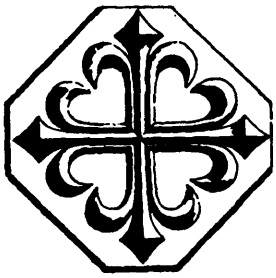
1.0002



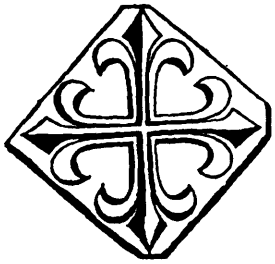
1.0003



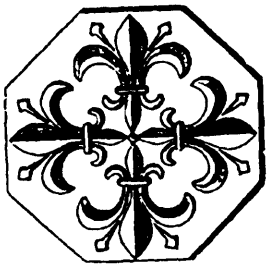
1.0004



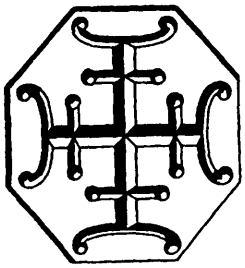
1.0005



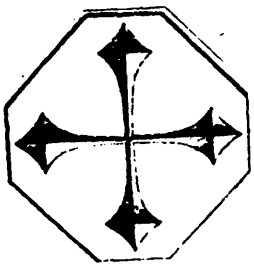
1.0006



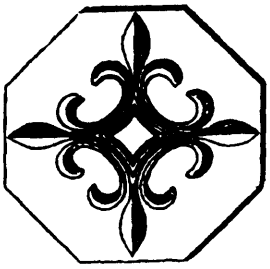
1.0007



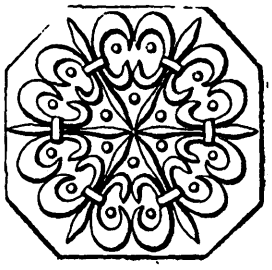
1.0008



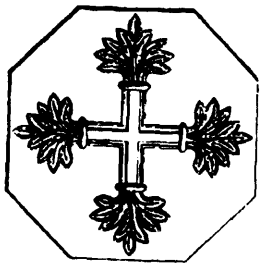
1.0009



1.0010



1.0011

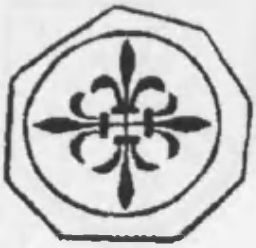


1.0012

1.0013

1.0014

1.0015

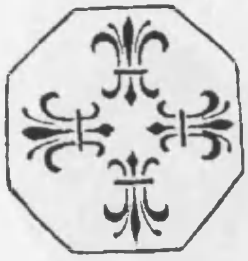


1.0016

1.0017

1.0018

1.0019



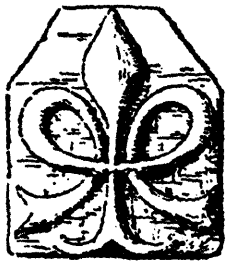
1.0020

1.0021

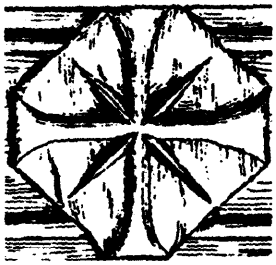
1.0022

1.0023

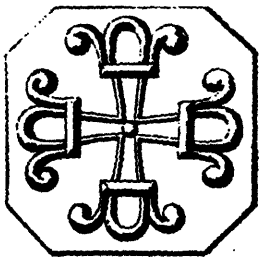
1.0024



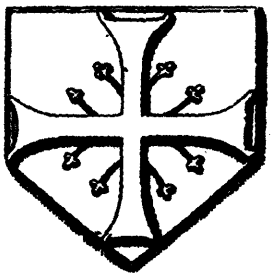
1.0025



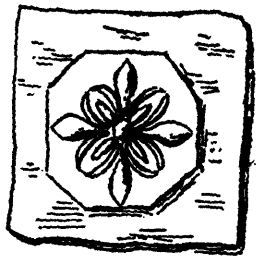
1.0026



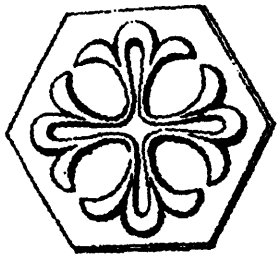
1.0027



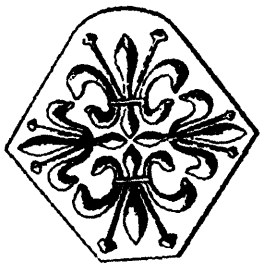
1.0028



1.0029

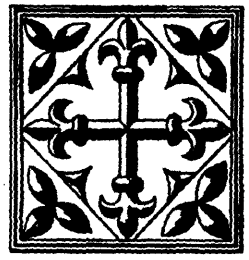


1.0030

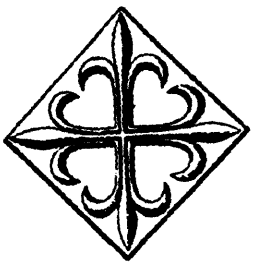


1.0031

1.0032

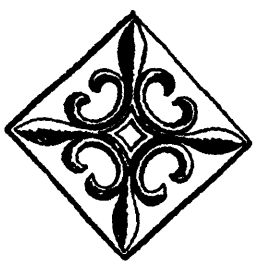


1.0033



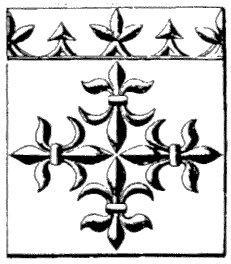
1.0034

1.0035

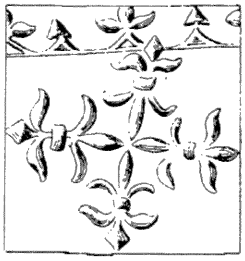


1.0036

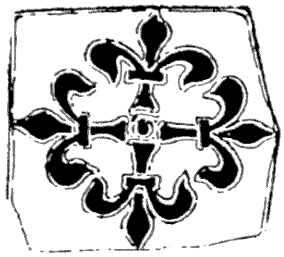
1.0037



1.0038

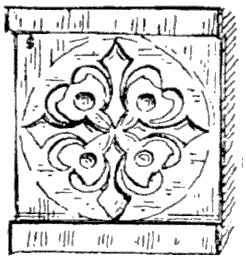


1.0039

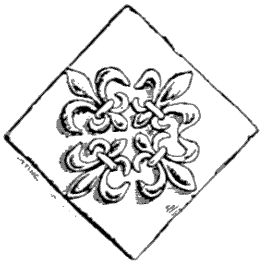


1.0040

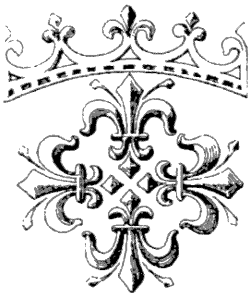
1.0041



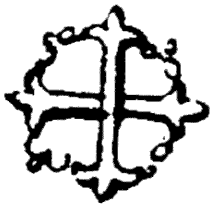
1.0042



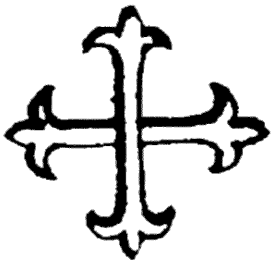
1.0043



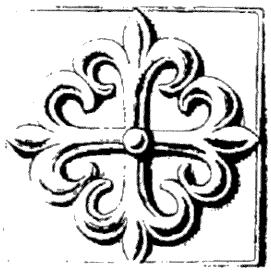
1.0044



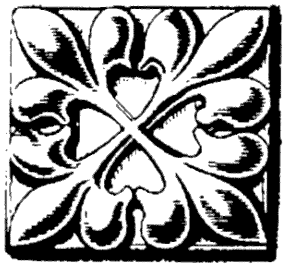
1.0045



1.0046



1.0047



1.0048

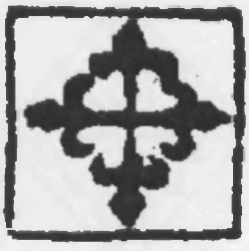
1.0049

1.0050

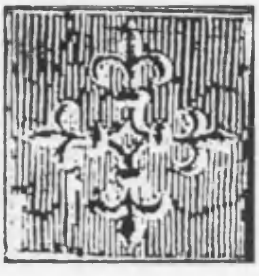
1.0051

1.0052

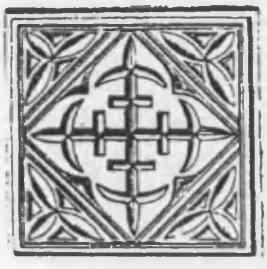
1.0053



1.0054



1.0055



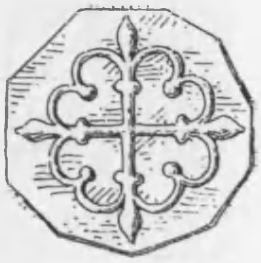
1.0056

1.0057

1.0058

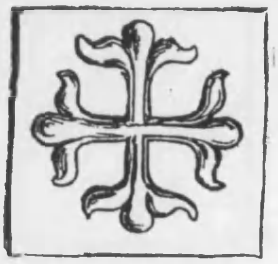
1.0059

1.0060

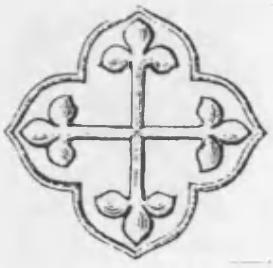


1.0061

1.0062



1.0063



1.0064

1.0065

1.0066

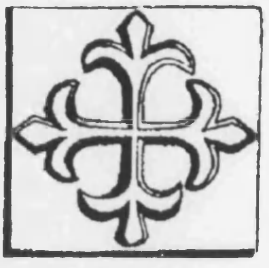
1.0067

1.0068

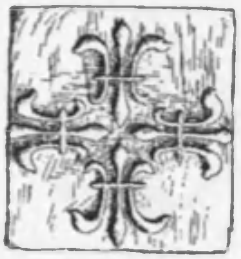
1.0069

1.0070

1.0071

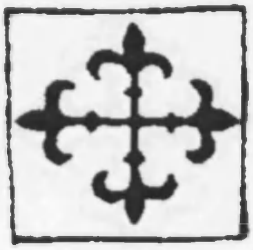


1.0072



1.0073

1.0074



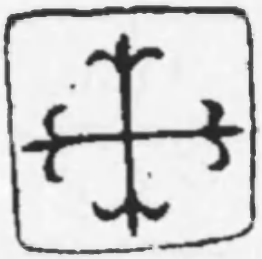
1.0075

1.0076

1.0077

1.0078

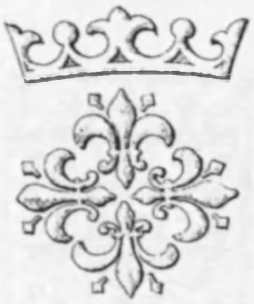
1.0079



1.0080

1.0081

1.0082



1.0083

1.0084

1.0085

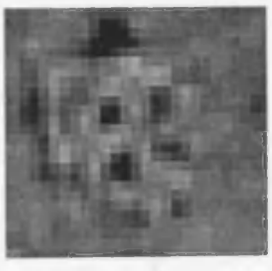
1.0086

1.0087

1.0088

1.0089

1.0090



1.0091

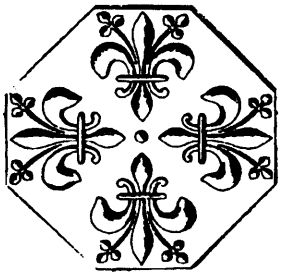
1.0092

1.0093

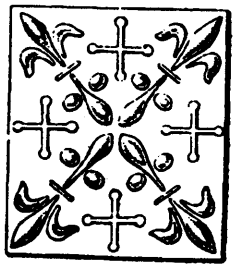
1.0094

1.0095

1.0096

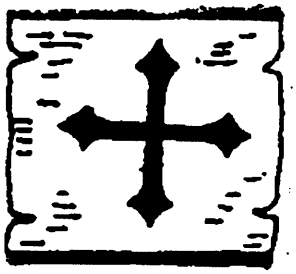


1.0097

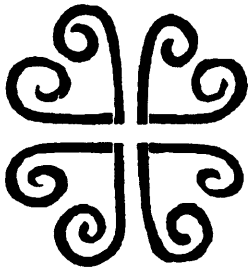


1.0098

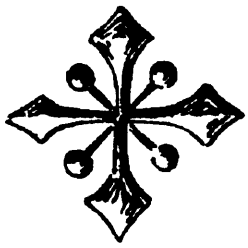
1.0099



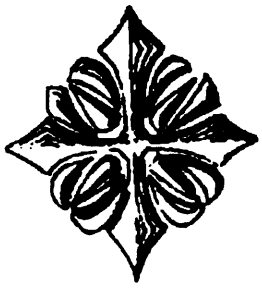
1.0100



1.0101

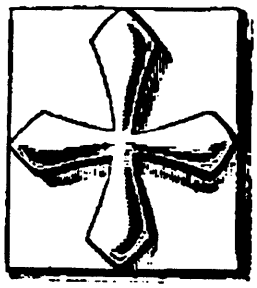


1.0102

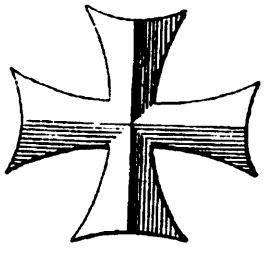


1.0103

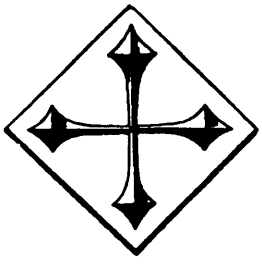
1.0104



1.0105



1.0106

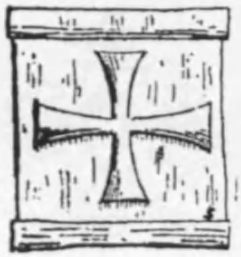


1.0107

1.0108

1.0109

1.0110



1.0111

1.0112

1.0113

1.0114

1.0115

1.0116

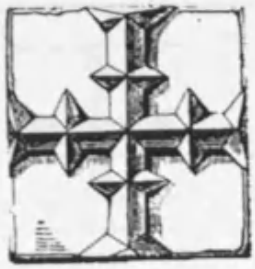
1.0117

1.0118

1.0119

1.0120

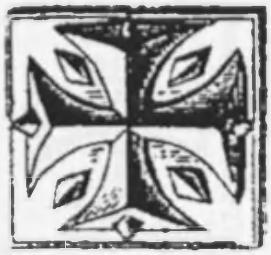
1.0121



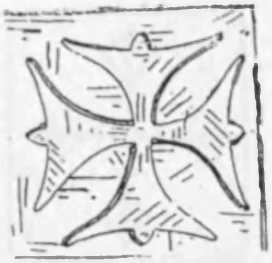
1.0122

1.0123

1.0124



1.0125



1.0126

1.0127

1.0128

1.0129

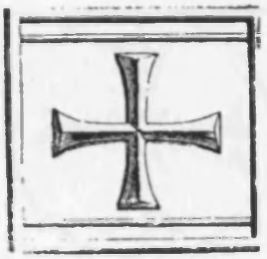
1.0130

1.0131

1.0132

1.0133

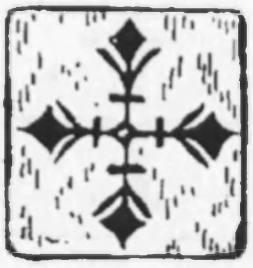
1.0134



1.0135

1.0136

1.0137

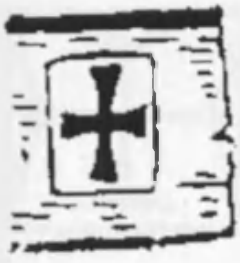


1.0138

1.0139

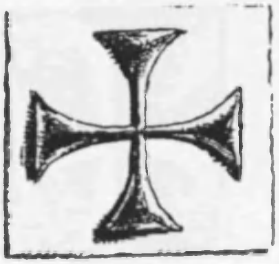
1.0140

1.0141



1.0142

1.0143



1.0144

1.0145

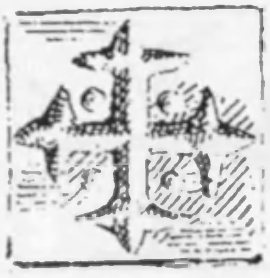
1.0146

1.0147

1.0148

1.0149

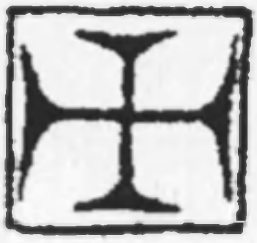
1.0150



1.0151

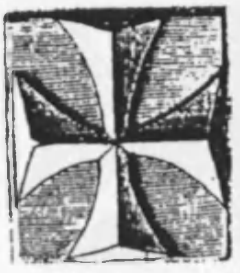
1.0152

1.0153



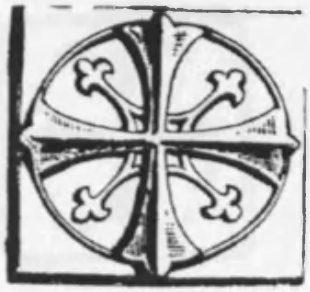
1.0154

1.0155



1.0156

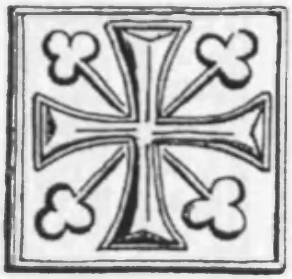
1.0157



1.0158

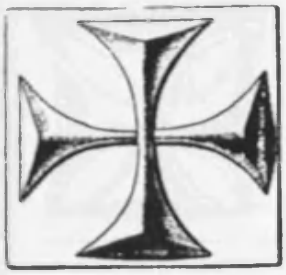
1.0159

1.0160

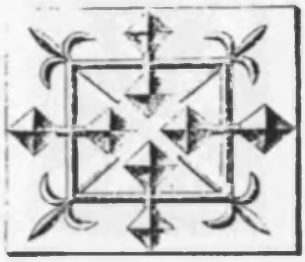


1.0161

1.0162

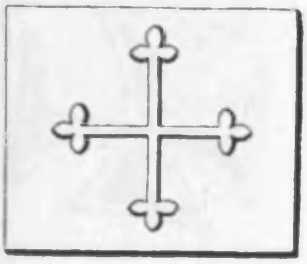


1.0163



1.0164

1.0165



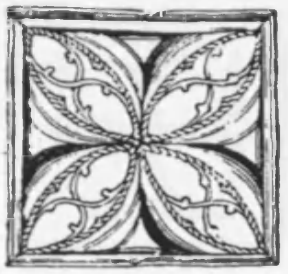
1.0166

1.0167

1.0168

1.0169

1.0170



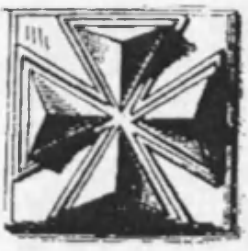
1.0171

1.0172

1.0173

1.0174

1.0175

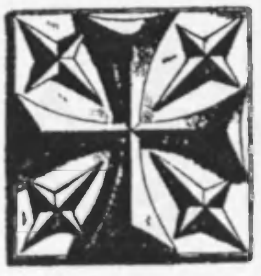


1.0176

1.0177

1.0178

1.0179



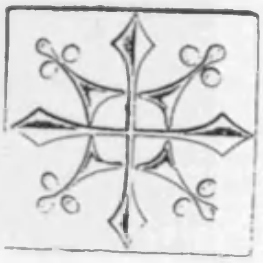
1.0180

1.0181

1.0182

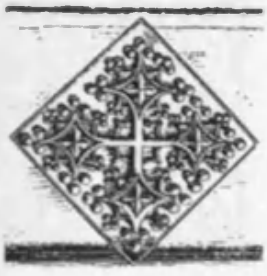
1.0183

1.0184



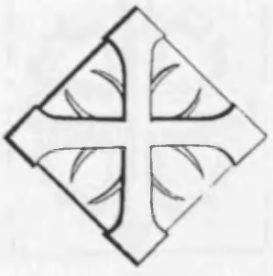
1.0185

1.0186



1.0187

1.0188



1.0189

1.0190

1.0191

1.0192

1.0193

1.0194

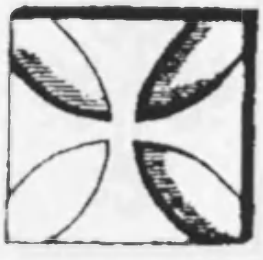
1.0195

1.0196

1.0197

1.0198

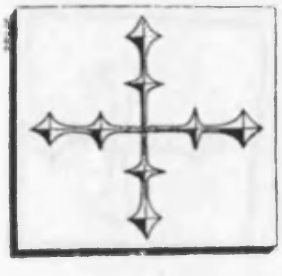
1.0199



1.0200

1.0201

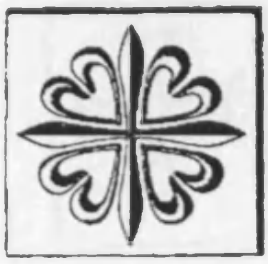
1.0202



1.0203

1.0204

1.0205



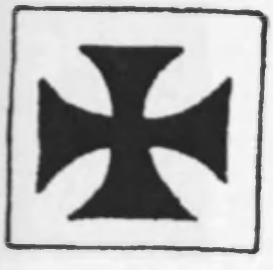
1.0206

1.0207

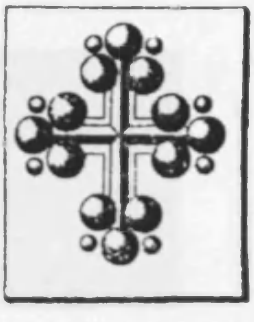
1.0208

1.0209

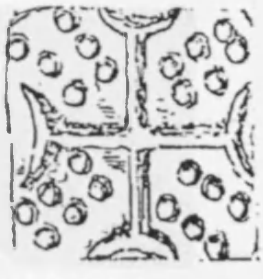
1.0210



1.0211

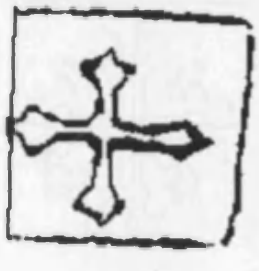


1.0212

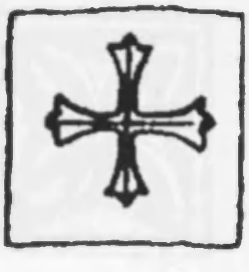


1.0213

1.0214



1.0215



1.0216

1.0217

1.0218

1.0219

1.0220

1.0221

1.0222

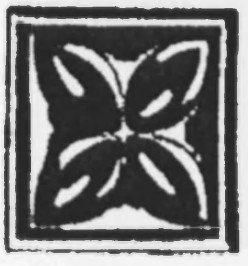
1.0223

1.0224

1.0225

1.0226

1.0227



1.0228

1.0229

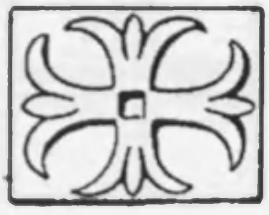
1.0230

1.0231

1.0232

1.0233

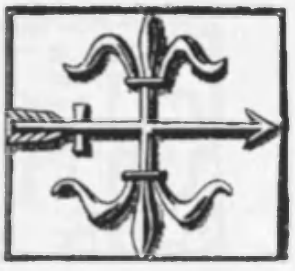
1.0234



1.0235

1.0236

1.0237



1.0238

1.0239

1.0240

1.0241

1.0242

1.0243

1.0244

1.0245

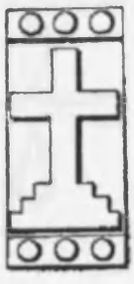
1.0246

1.0247

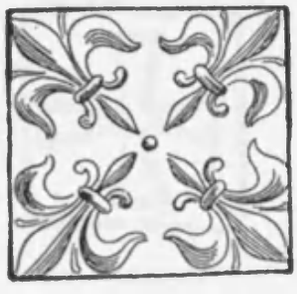
1.0248

1.0249

1.0250

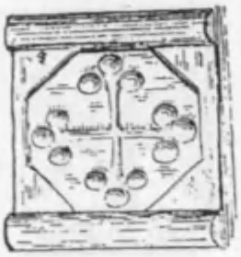


1.0251



1.0252

1.0253



1.0254

1.0255

1.0256

1.0257

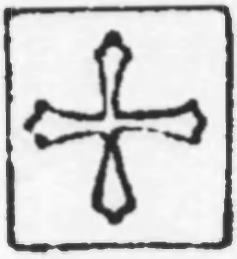
1.0258

1.0259

1.0260

1.0261

1.0262



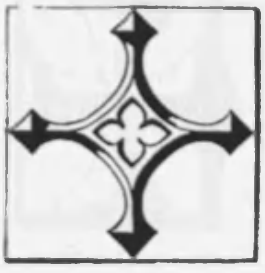
1.0263

1.0264

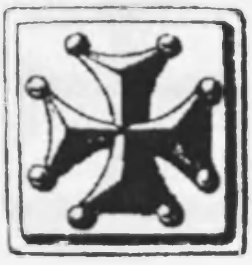
1.0265

1.0266

1.0267



1.0268



1.0269

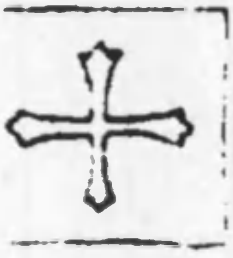
1.0270

1.0271

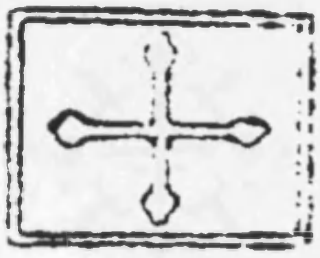
1.0272

1.0273

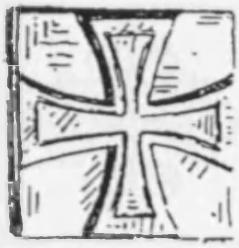
1.0274



1.0275

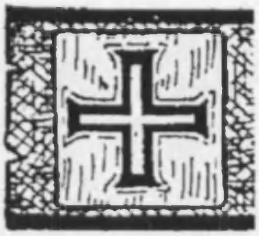


1.0276



1.0277

1.0278

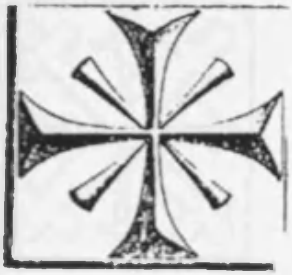


1.0279

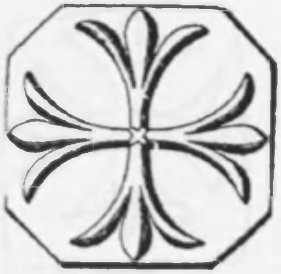
1.0280

1.0281

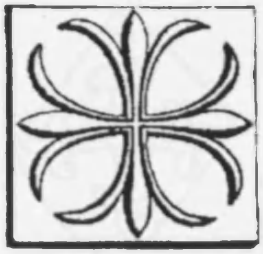
1.0282



1.0283



1.0284

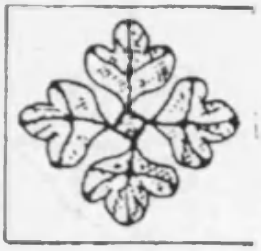


1.0285

1.0286

1.0287

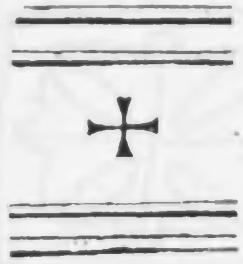
1.0288



1.0289

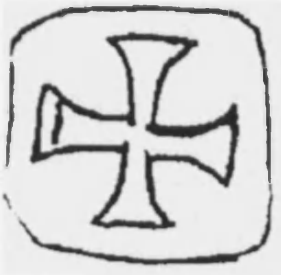
1.0290

1.0291

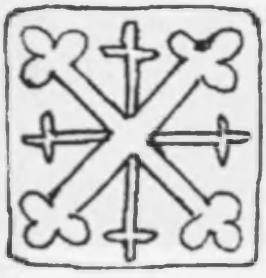


1.0292

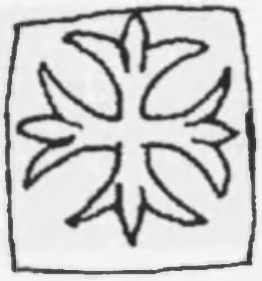
1.0293



1.0294

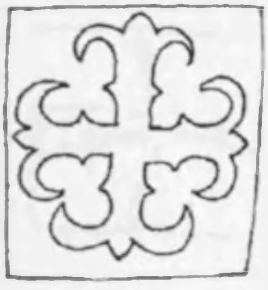


1.0295



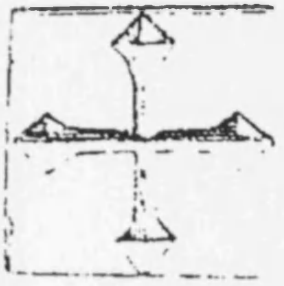
1.0296

1.0297



1.0298

1.0299



1.0300

1.0301

1.0302

1.0303

1.0304

1.0305

1.0306

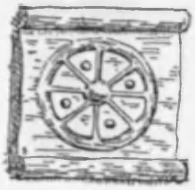
1.0307

1.0308

1.0309

1.0310

2.0001



2.0002

2.0003

2.0004

2.0005

2.0006

2.0007

2.0008

2.0009

2.0010

2.0011

2.0012

2.0013

2.0014

2.0015

2.0016

2.0017

2.0018

2.0019

2.0020

2.0021

2.0022

2.0023

2.0024

2.0025

2.0026

2.0027

2.0028

2.0029

2.0030

2.0031

2.0032

2.0033

2.0034

2.0035

2.0036

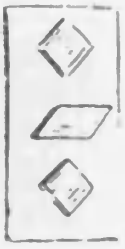
2.0037

2.0038

2.0039

2.0040

2.0041



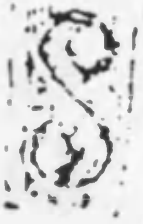
2.0042

2.0043

2.0044

2.0045

2.0046

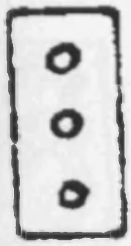


2.0047

2.0048

2.0049

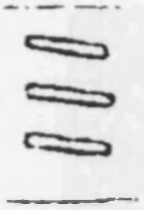
2.0050



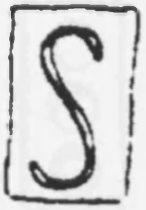
2.0051

2.0052

2.0053



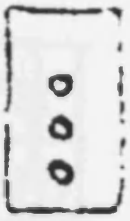
2.0054



2.0055

2.0056

2.0057



2.0058

2.0059

2.0060

2.0061

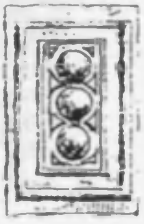
2.0062

2.0063

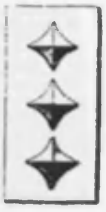
2.0064

2.0065

2.0066

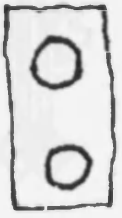


2.0067

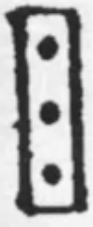


2.0068

2.0069



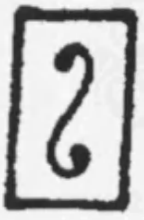
2.0070



2.0071

2.0072

2.0073



2.0074

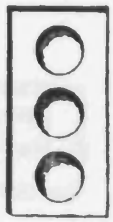
2.0075

2.0076

2.0077

2.0078

2.0079



2.0080

2.0081

2.0082

2.0083

2.0084

2.0085

2.0086

2.0087

2.0088

2.0089

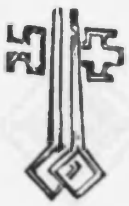
2.0090

2.0091

2.0092

2.0093

2.0094



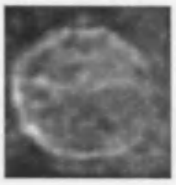
2.0095

2.0096

2.0097

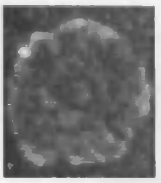
2.0098

2.0099



2.0100

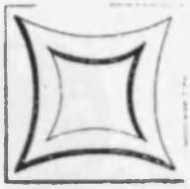
2.0101



2.0102

2.0103

2.0104

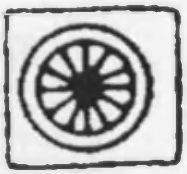


2.0105

2.0106

2.0107

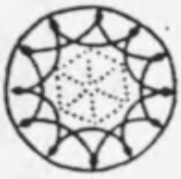
2.0108



2.0109

2.0110

2.0111



2.0112

2.0113

2.0114

2.0115

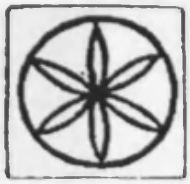
2.0116

2.0117

2.0118

2.0119

2.0120



2.0121

2.0122

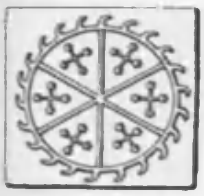
2.0123

2.0124

2.0125

2.0126

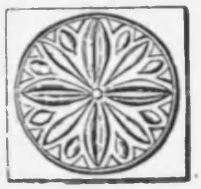
2.0127



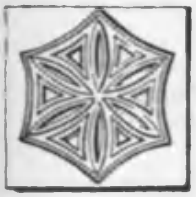
2.0128

2.0129

2.0130



2.0131



2.0132

2.0133

2.0134

2.0135

2.0136

2.0137

2.0138

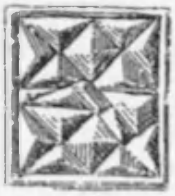
2.0139

2.0140

2.0141

2.0142

2.0143



2.0144

2.0145

2.0146

2.0147

2.0148

2.0149

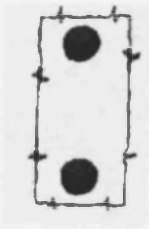
2.0150

2.0151

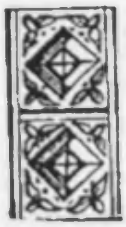
2.0152

2.0153

2.0154



2.0155

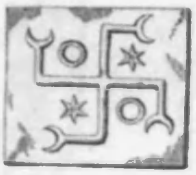


2.0156

2.0157

2.0158

2.0159



2.0161

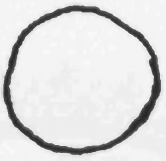
2.0162

2.0160

2.0163

2.0165

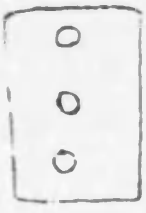
2.0166



2.0167

2.0164

2.0168



2.0169

2.0170

2.0171

2.0172

2.0173

2.0174

2.0175

2.0176

2.0177

2.0178

2.0179

3.0001

3.0002

3.0003

3.0004

3.0005

3.0006

3.0007

3.0008

3.0009

3.0010

3.0011

3.0012

3.0013

3.0014

3.0015

3.0016

3.0017

3.0018

3.0019

3.0020

3.0021

3.0022

3.0023

3.0024

3.0025

3.0026

3.0027

3.0028

3.0029

3.0030

3.0031

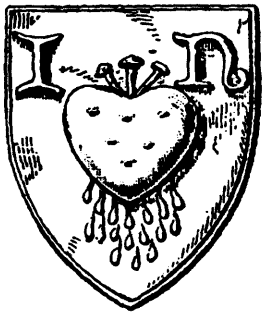
3.0032

3.0033

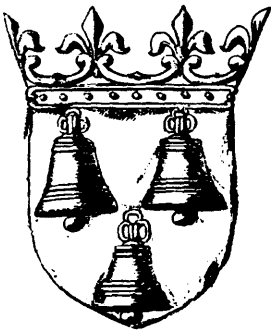
3.0034

3.0035

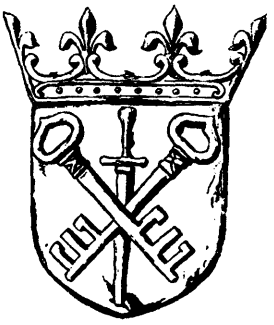
3.0036



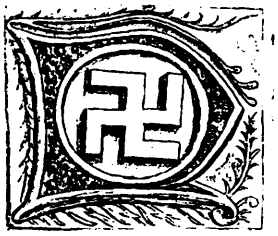
3.0037



3.0038

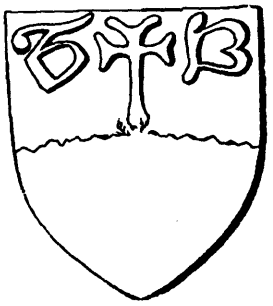


3.0039

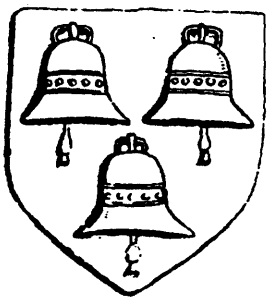


3.0040

3.0041



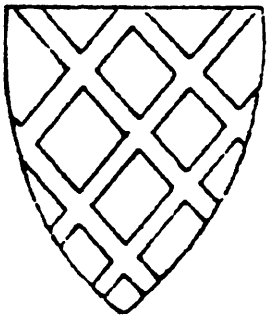
3.0042



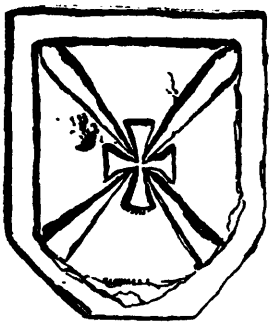
3.0043

3.0044

3.0045



3.0046



3.0047

3.0048

3.0049

3.0050

3.0051

3.0052

3.0053

3.0054

3.0055

3.0056

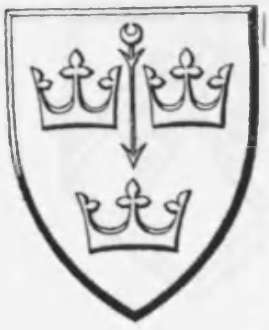
3.0057

3.0058

3.0059

3.0060

3.0061



3.0062

3.0063

3.0064

3.0065

3.0066

3.0067

3.0068

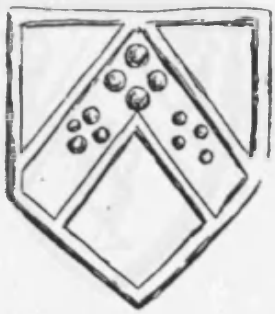
3.0069

3.0070

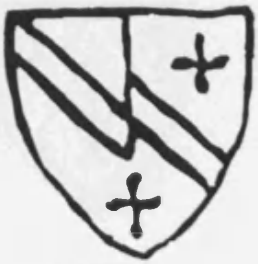
3.0071

3.0072

3.0073



3.0074



3.0075

3.0076

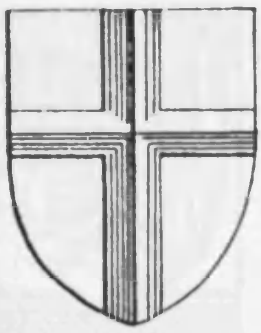
3.0077

3.0078

3.0079

3.0080

3.0081



3.0082

3.0083

3.0084

3.0085

3.0086

3.0087

3.0088

3.0089

3.0090

3.0091

3.0092

3.0093

3.0094

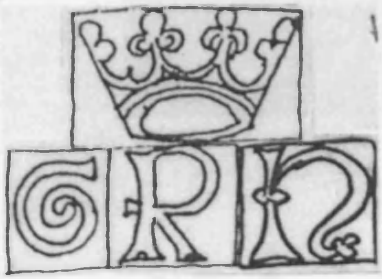
3.0095

3.0096

3.0099

3.0097

3.0098



3.0101

3.0102

3.0100

3.0103

3.0104

3.0105

3.0106

4.0001

4.0002

4.0003

4.0004

4.0005

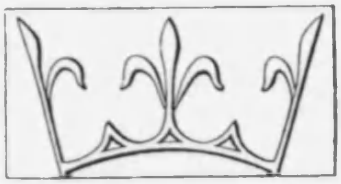
4.0006

4.0007

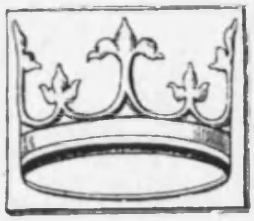
4.0008

4.0009

4.0010



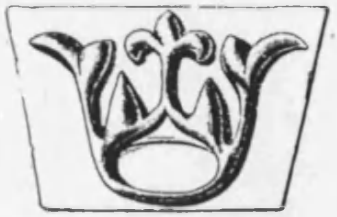
4.0011



4.0012

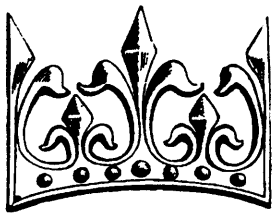
4.0013

4.0014

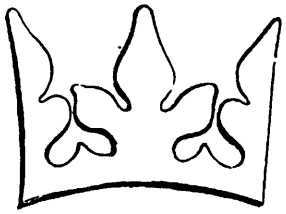


4.0015

4.0016

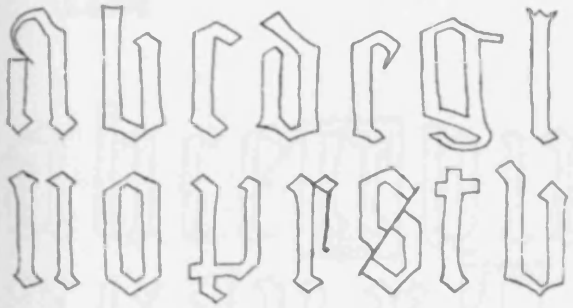


4.0017

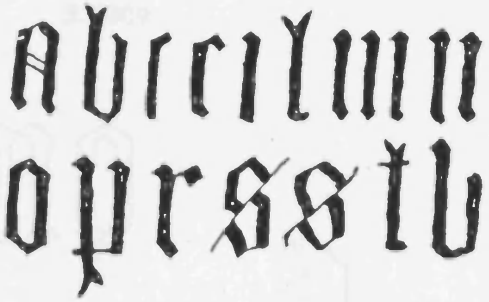


4.0018

5.0001



5.0002

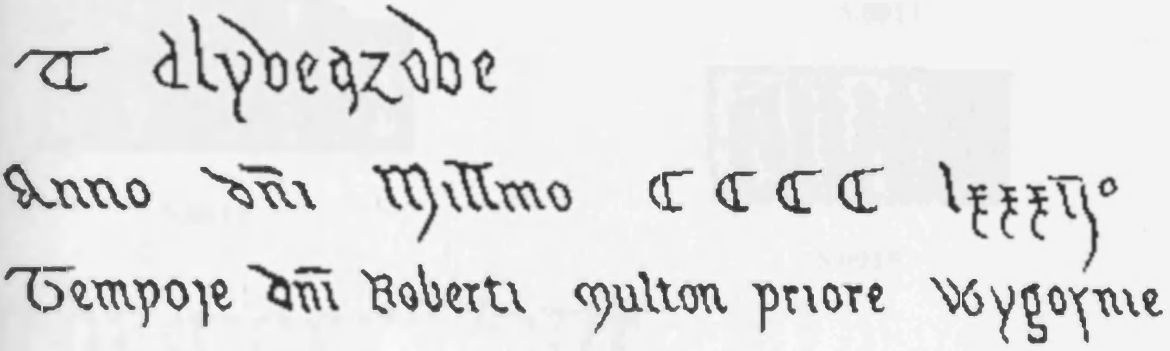


5.0003

5.0004

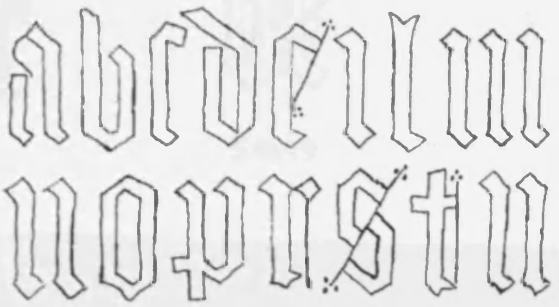
5.0005

5.0006

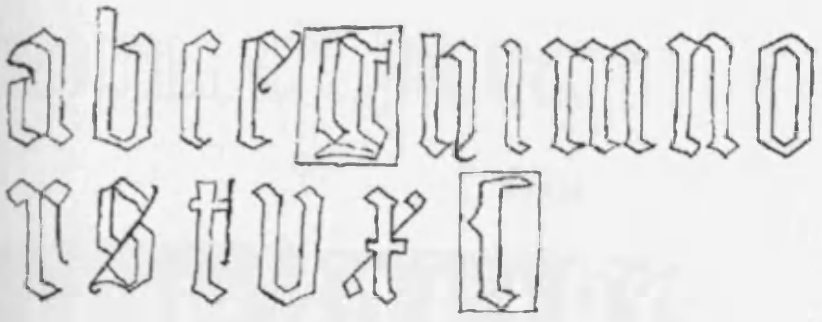


5.0007

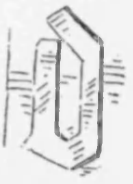
5.0008



5.0009



5.0010

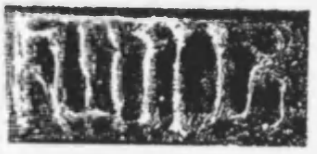


5.0014

5.0012

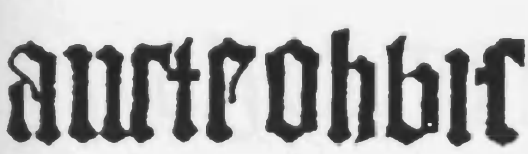
5.0013

5.0011



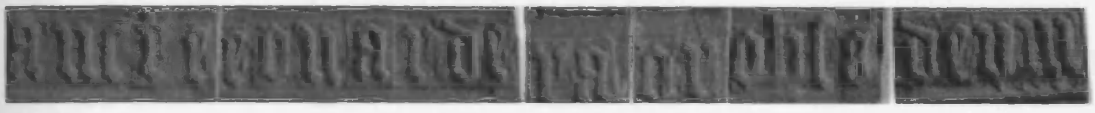
5.0015

5.0016

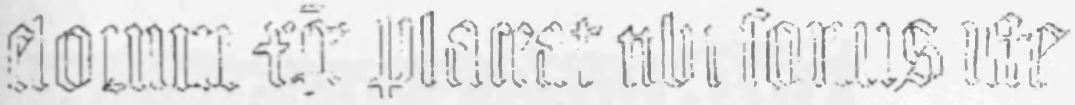


5.0017

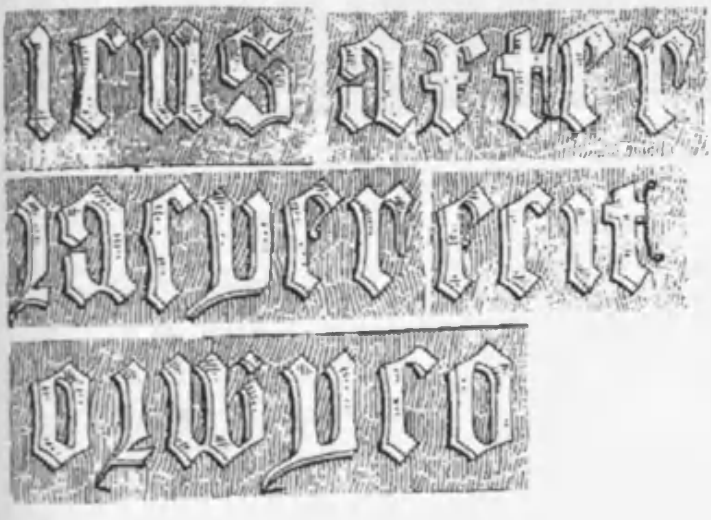
5.0019



5.0018

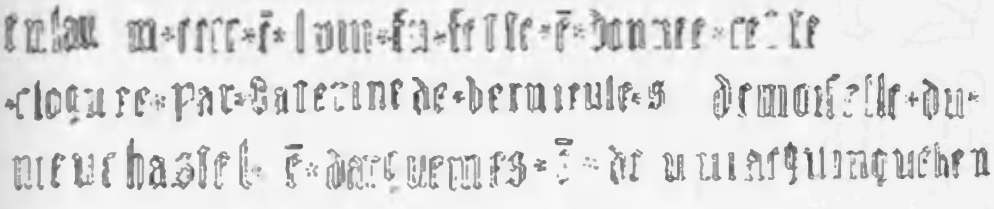


5.0020



5.0023

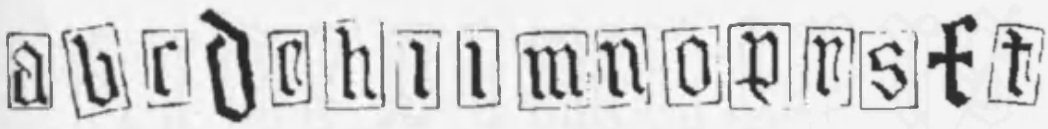
5.0021



5.0022

al praice be e even to god

5.0024

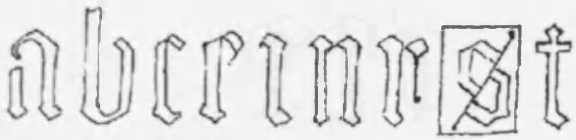


5.0025

5.0026

5.0027

5.0028

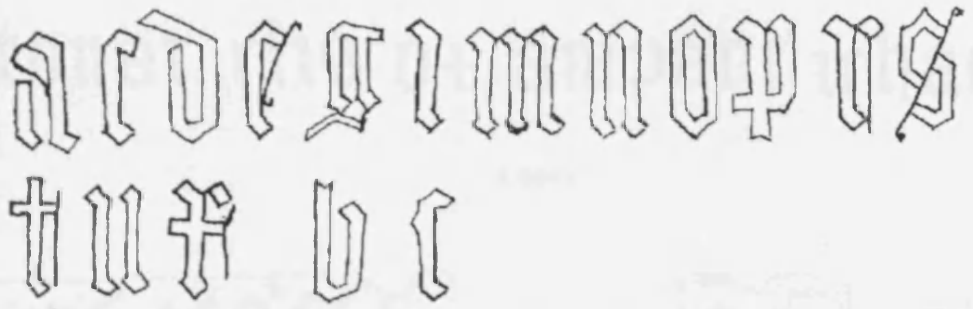


5.0031

5.0029

5.0032

5.0030



5.0033

5.0034

5.0036

5.0037

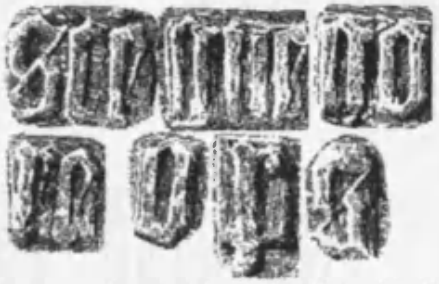
5.0035

5.0038

5.0039

5.0040

5.0042

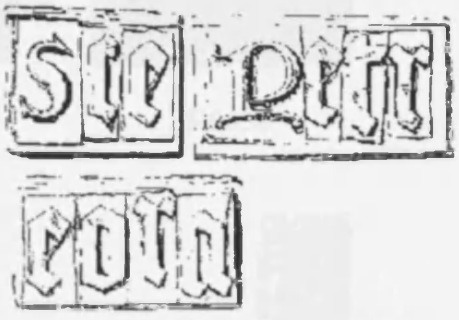


5.0041

5.0043

5.0044

5.0047

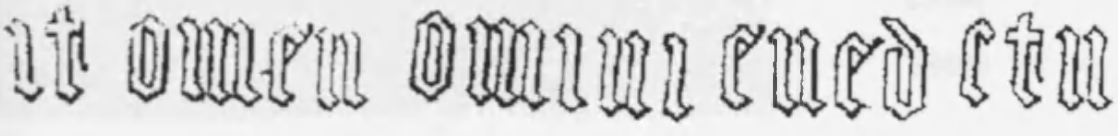


5.0046

5.0053

5.0045

5.0048



5.0049

5.0050

5.0051

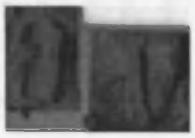
5.0052

5.0054

5.0055

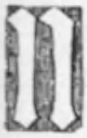
5.0056

5.0057



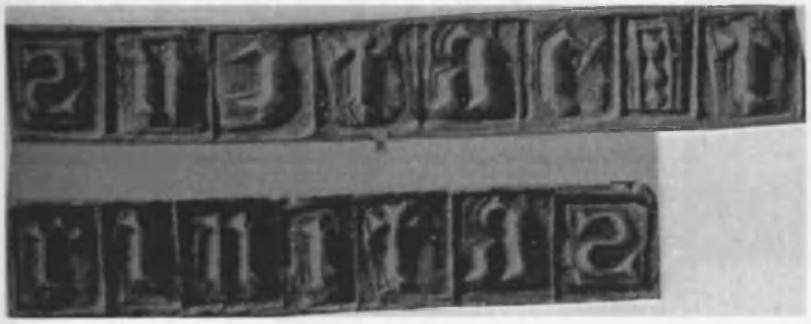
5.0058

5.0059



5.0060

5.0061



5.0062

5.0066

5.0063

5.0065

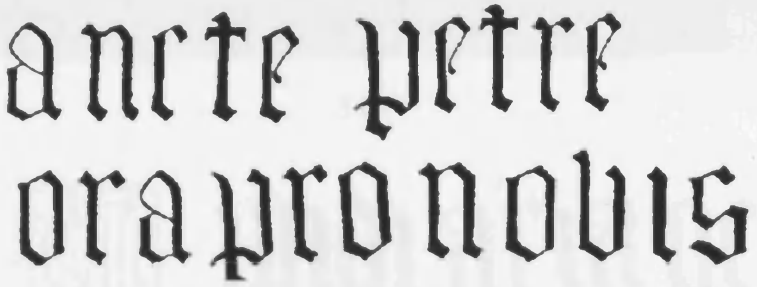
5.0064

5.0067

5.0068

5.0069

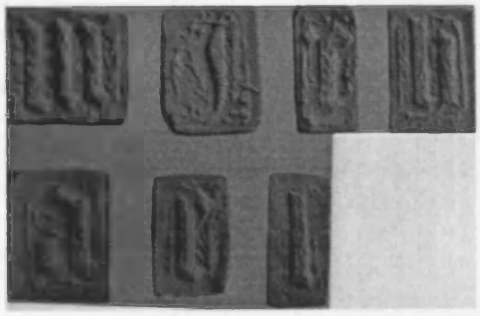
5.0071



5.0070

5.0072

5.0073



5.0076

5.0074

5.0075

5.0077

5.0078 5.0079

5.0080

5.0081

5.0082

5.0083 5.0084 5.0085 5.0086 5.0087

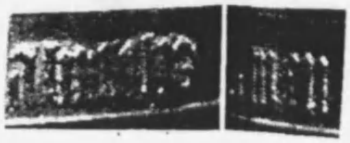
5.0088 5.0089 5.0090 5.0091 5.0092

5.0093

5.0094

5.0095

5.0096



5.0097

6.0001

6.0002

6.0003

6.0004

6.0005

6.0006

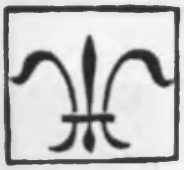
6.0007

6.0008

6.0009

6.0010

6.0011



6.0012

6.0013

6.0014

6.0015

6.0016

6.0017

6.0018

6.0019

6.0020

6.0021

6.0022

6.0023

6.0024

6.0025

6.0026

6.0027

6.0028

6.0029

6.0030

6.0031

6.0032

6.0033

7.0001

7.0002

7.0003

7.0004

7.0005

7.0006

7.0007

7.0008

7.0009

7.0010

7.0011

7.0012

7.0013

7.0014

7.0015

7.0016

7.0017

7.0018

7.0019

7.0020

7.0021

7.0022

7.0023

7.0024

7.0025

7.0026

7.0027

7.0028

7.0029

7.0031

7.0030

7.0032

7.0033

7.0034

7.0035

7.0036

7.0037

7.0038

7.0039

7.0040

7.0041

7.0042

7.0043

7.0044

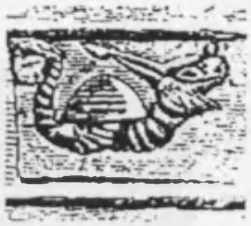
7.0045

7.0046

7.0047

7.0048

7.0049

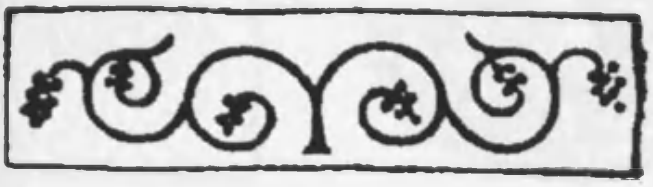


7.0050

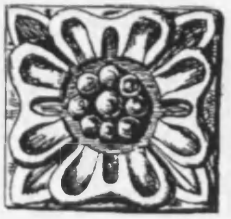
7.0051

7.0052

7.0053

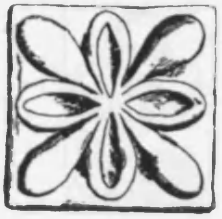


7.0054



7.0060

7.0055



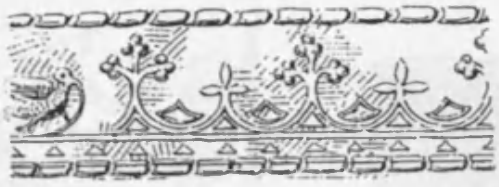
7.0061

7.0056

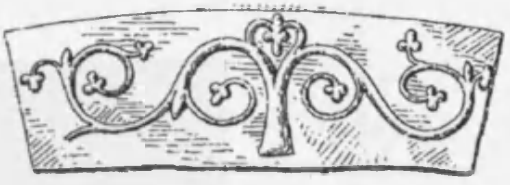
7.0062

7.0063

7.0057



7.0058



7.0059

7.0064

7.0065

7.0066

7.0067

7.0068

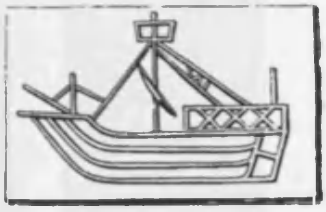
7.0069

7.0070

7.0071

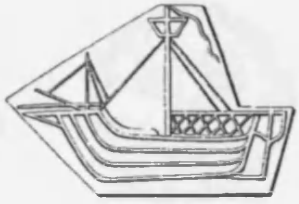
7.0072

7.0073

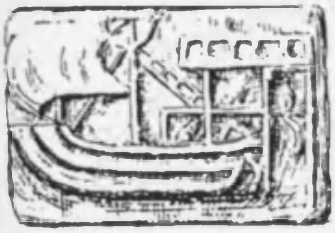


7.0074

7.0075



7.0076



7.0077

7.0078

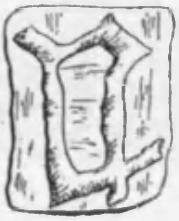
7.0079

7.0080

7.0081

7.0082

7.0083



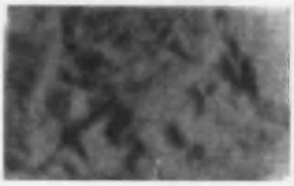
7.0084

7.0085

7.0086

7.0087

7.0088



7.0089

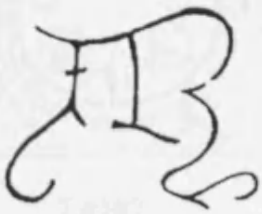
7.0090

7.0091

7.0092

7.0093

7.0094



7.0095

7.0096

7.0097

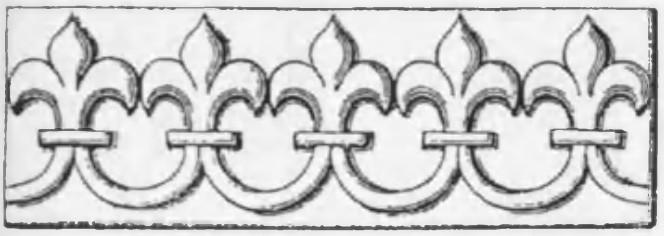
7.0098

7.0099

7.0100

7.0101

7.0103



7.0102

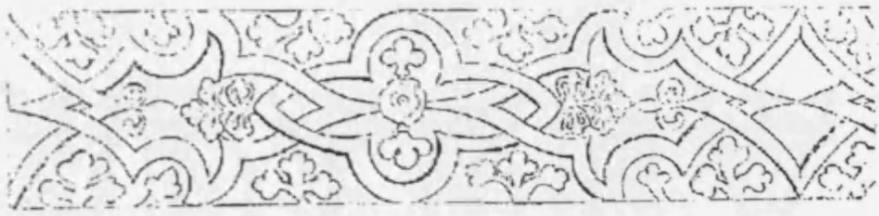
7.0104

7.0105

7.0106

7.0107

7.0109

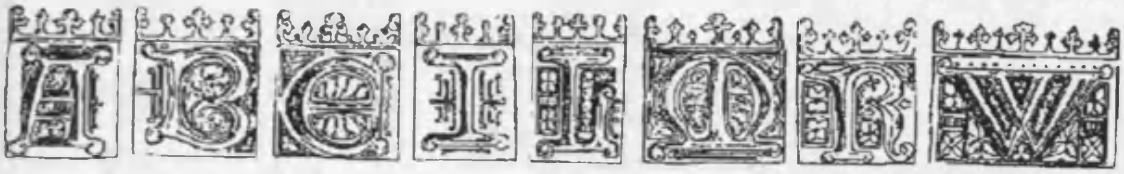


7.0108

7.0110

8.0001

8.0002



8.0003

8.0004

8.0006

8.0007

8.0005

8.0008

8.0009

8.0010

8.0012

8.0011

8.0013

8.0014

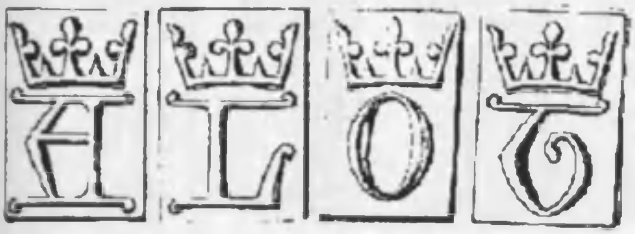
8.0015

8.0016

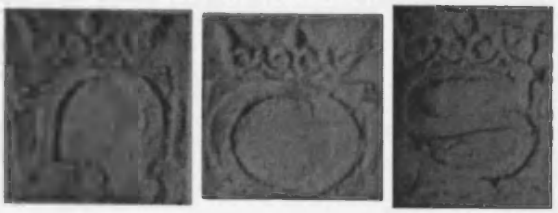
8.0017

8.0019

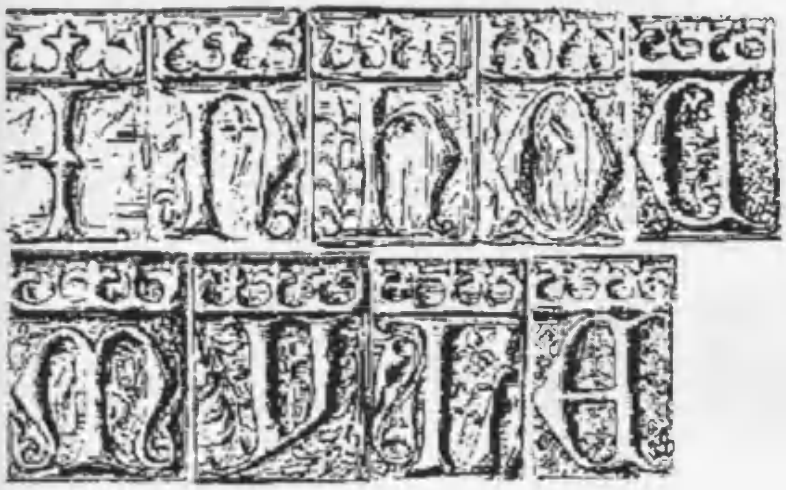
8.0018



8.0020



8.0025



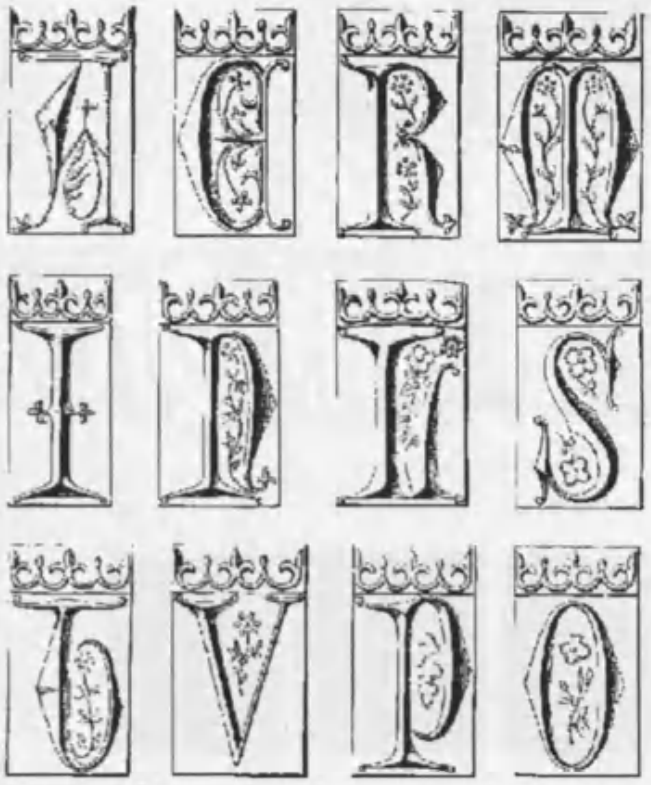
8.0021

8.0022

8.00023

8.0030

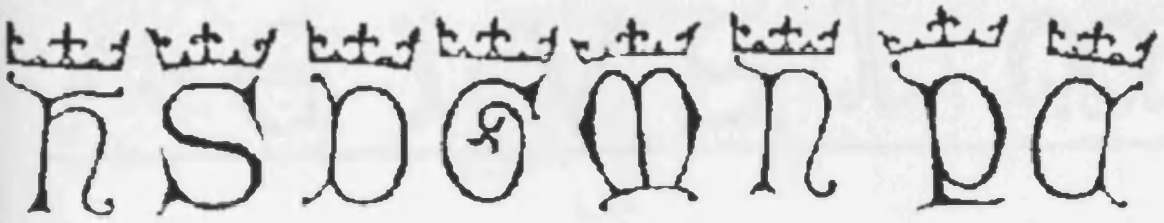
8.0026



8.0031

8.0024

8.0027

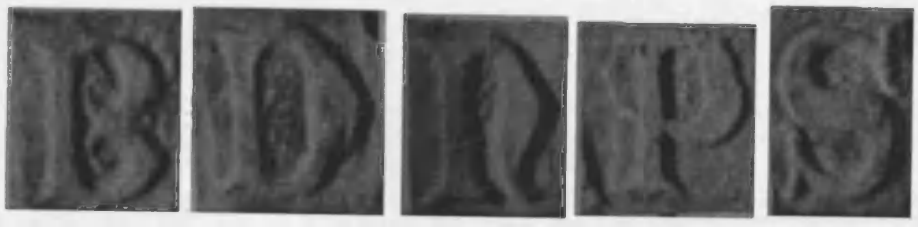


8.0028

8.0029

8.0032

8.0033



8.0034

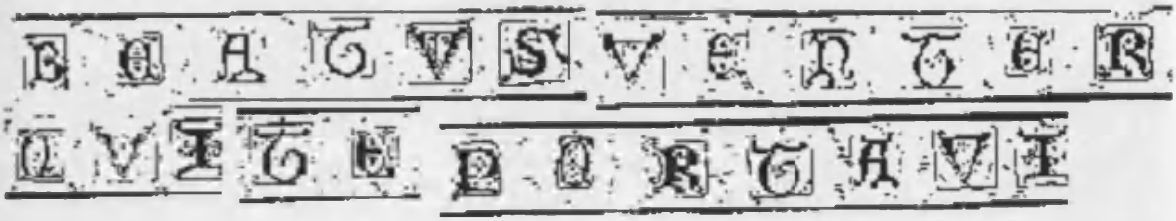
8.0035

8.0036

8.0037

8.0038

8.0039



8.0040

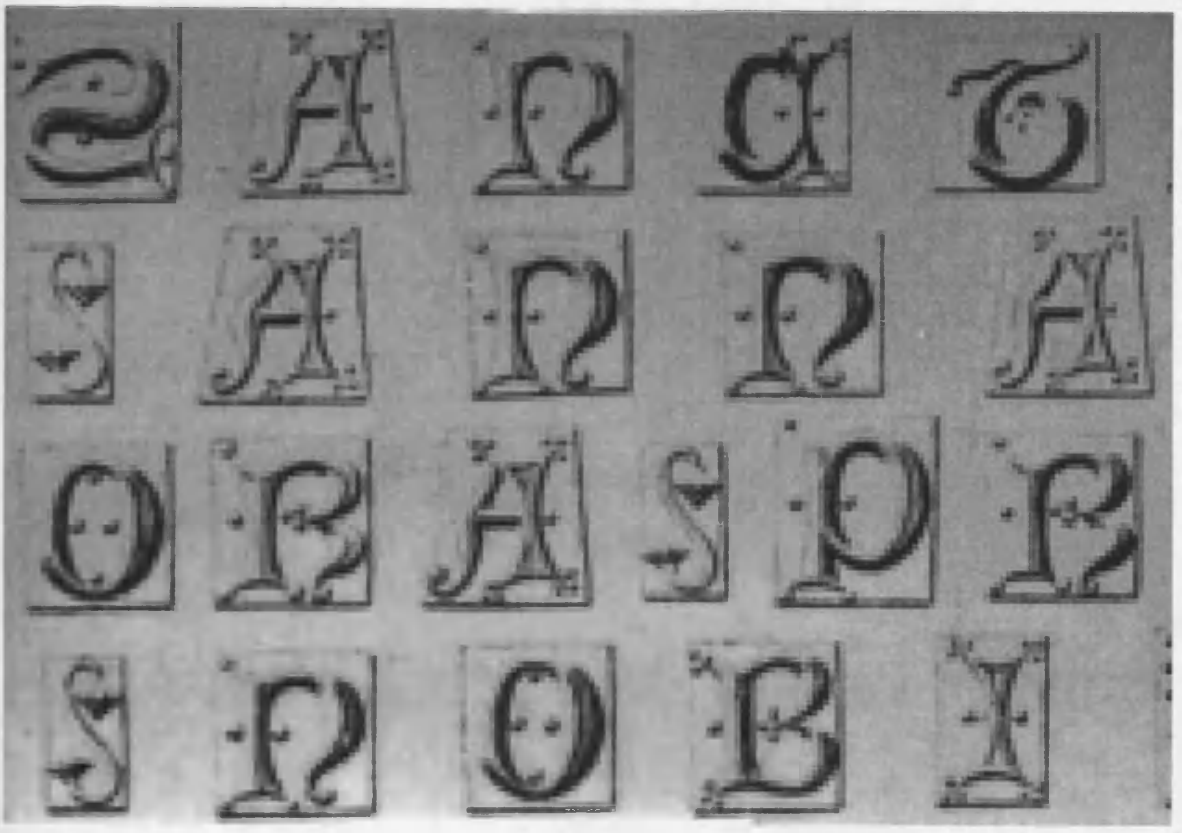
8.0041

8.0042

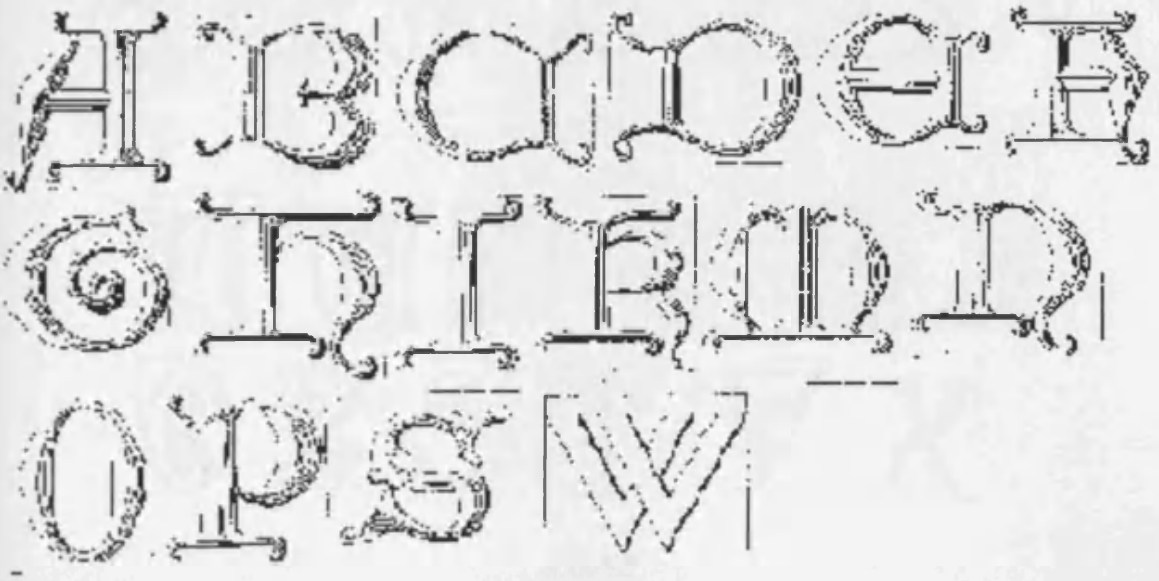
8.0043

8.0044

8.0047



8.0045



8.0046

8.0048

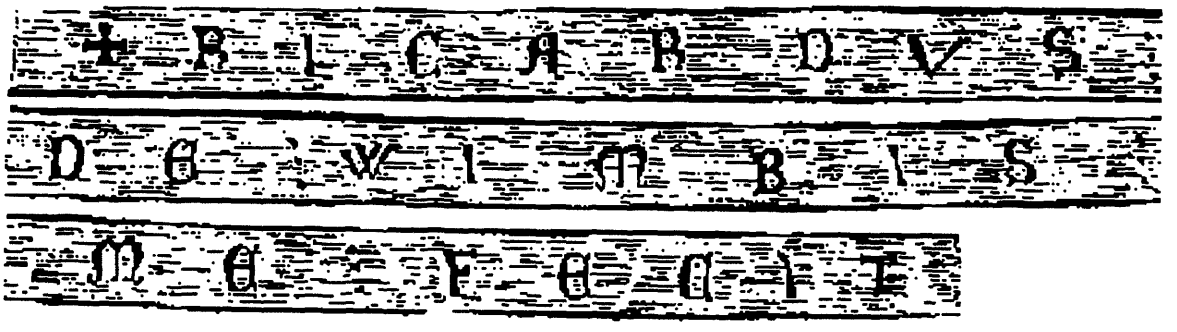
8.0049

8.0050

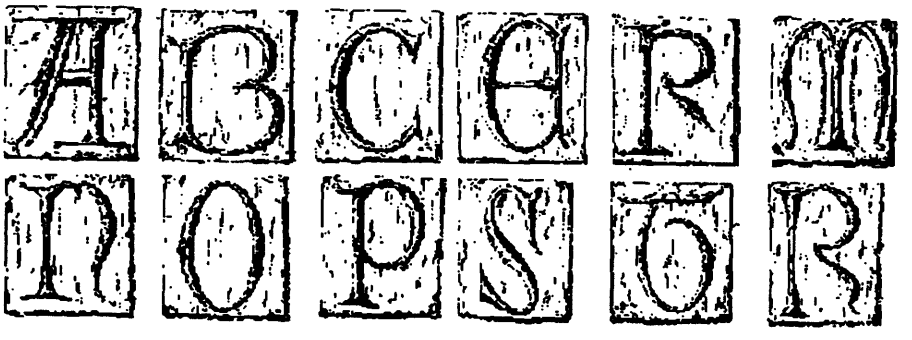
8.0051

8.0052

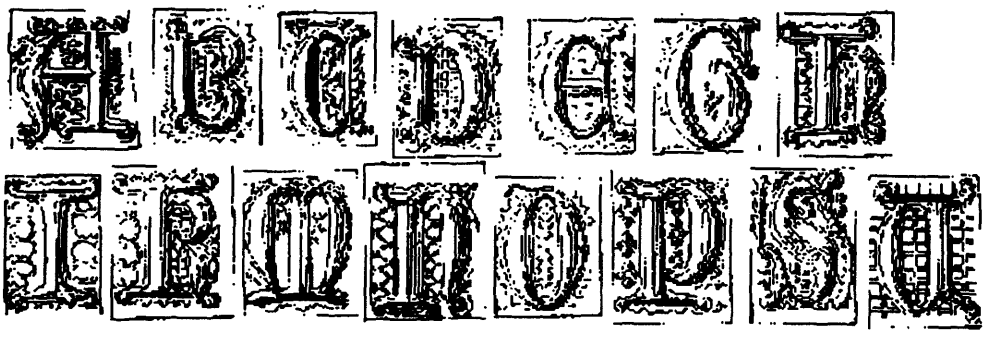
8.0053



8.0054



8.0055



8.0056

8.0057

5.0058

8.0061

8.0059

8.0060

8.0063

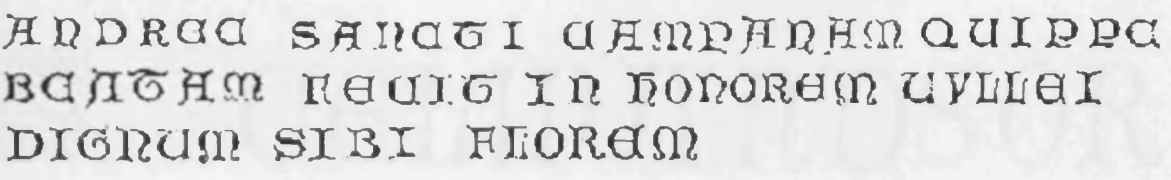
8.0062

8.0065

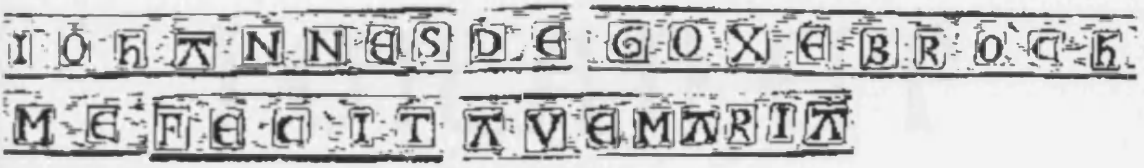
8.0066

8.0067

8.0064

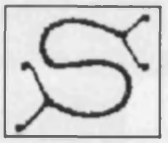


8.0068



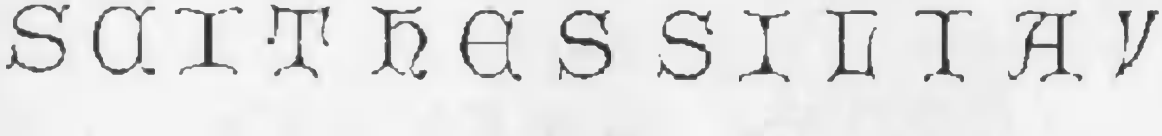
8.0069

8.0070



8.0072

8.0071



8.0073

8.0074

8.0075

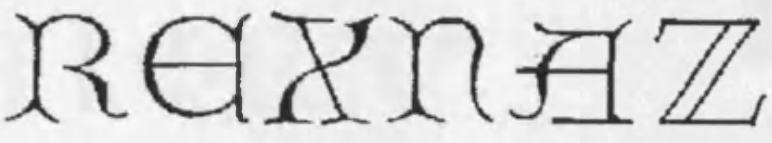
8.0076

8.0077

8.0078

8.0079

8.0080



8.0081

8.0082

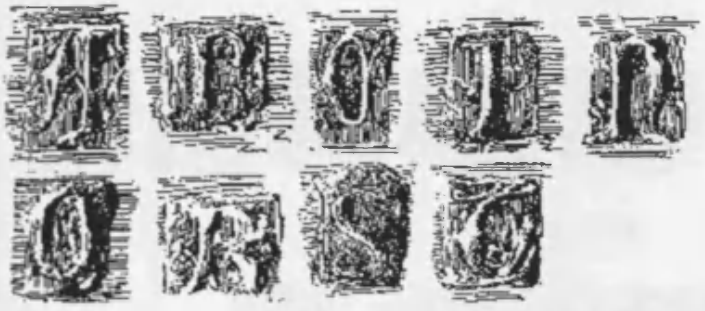
8.0083

8.0084

8.0087

8.0085

8.0086



8.0088

8.0091

8.0092

8.0089

8.0090

8.0093

8.0097

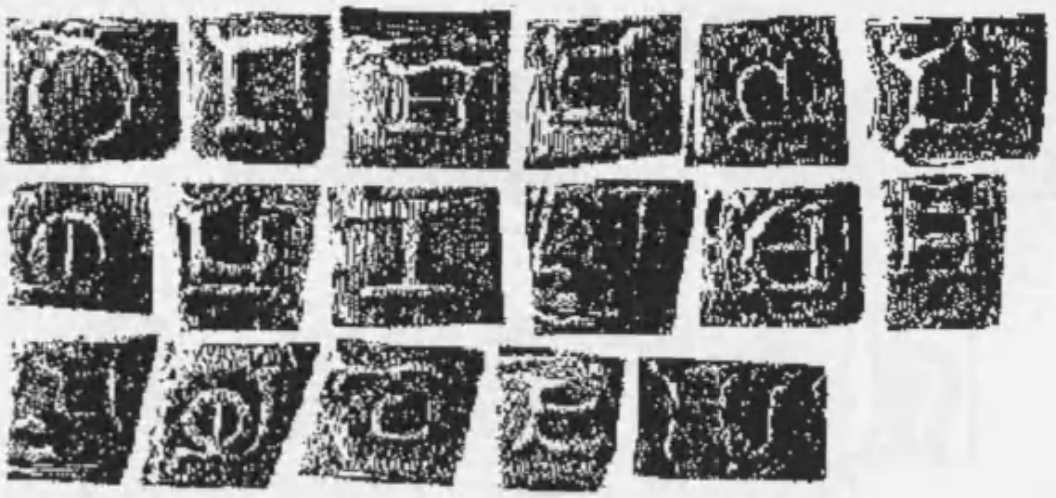
8.0094

8.0095

8.0096

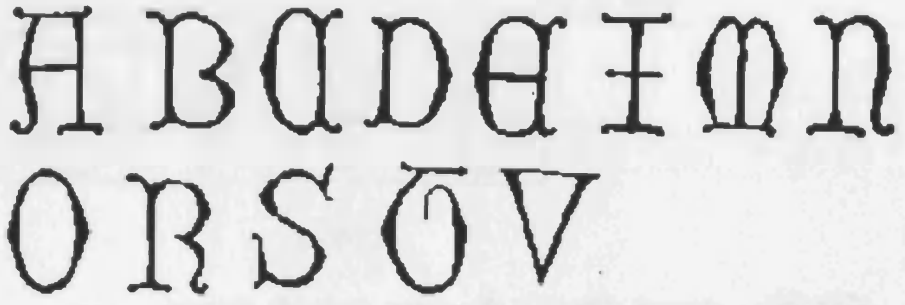
8.0098

8.0099

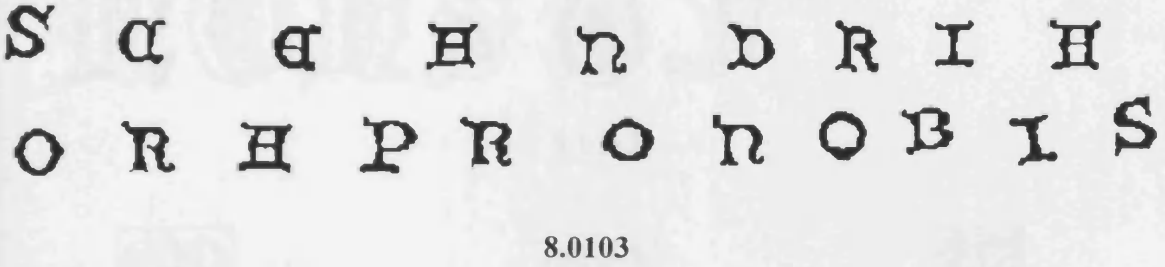


8.0100

8.0101



8.0102

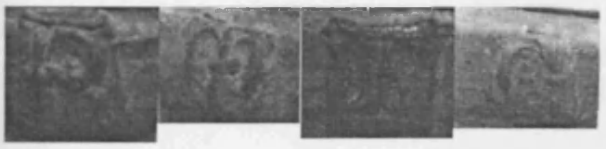


8.0103

8.0104

8.0105

8.0106



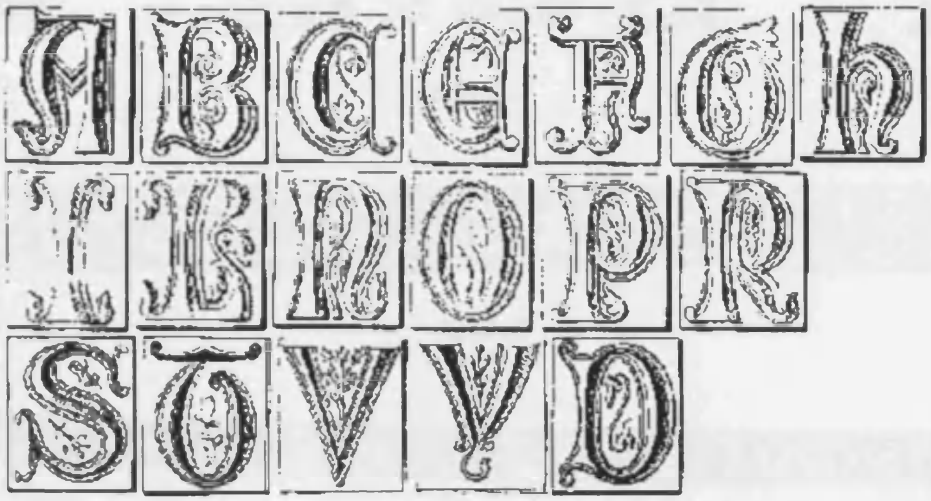
8.0107

8.0108

8.0109

8.0110

8.0111



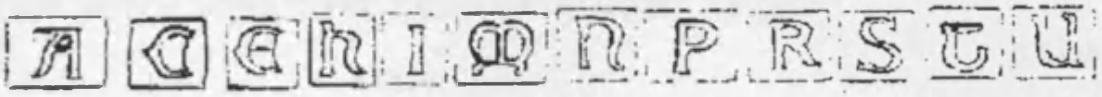
8.0012

8.0113

8.0114

8.0116

8.0117



8.0115

8.0118

8.0119

8.0121

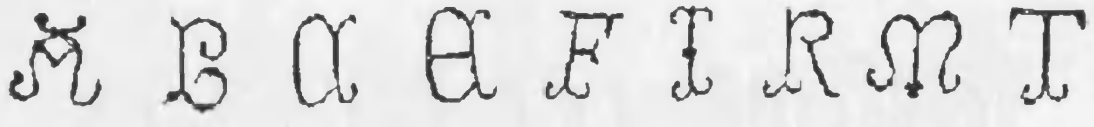
8.0124

8.0120

8.0122

8.0123

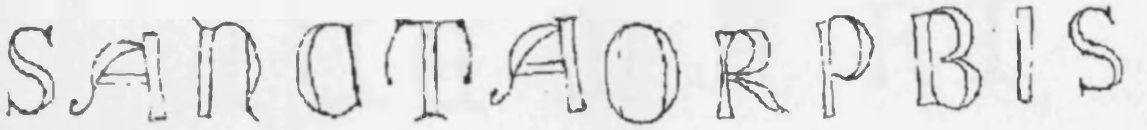
8.0129



8.0125

8.0126

8.0128



8.0127

8.0130

8.0131

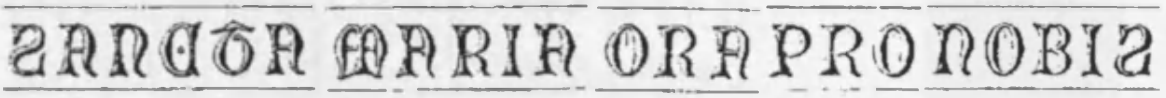
8.0132

8.0133

8.0134

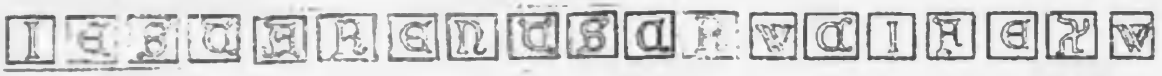
8.0138

8.0139



8.0135

8.0136



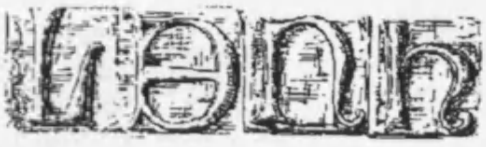
8.0137

8.0140

8.0141

8.0142

8.0143



8.0146

8.0144

8.0145

8.0147

8.0148

8.0151

8.0149

8.0152

8.0150

8.0153

8.0154

8.0155

8.0156

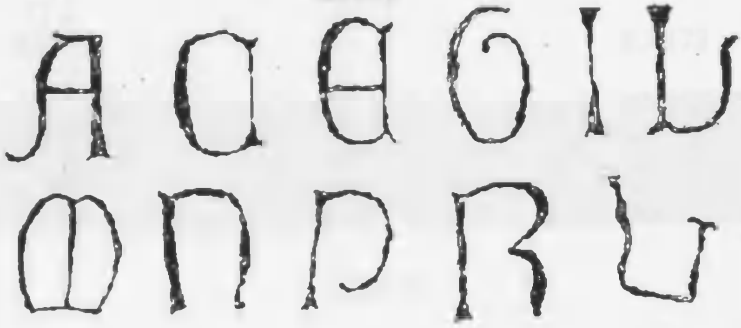
8.0159

8.0157

8.0158

8.0160 8.0164 8.0166

8.0161



8.0162

8.0163

8.0165

8.0167

8.0170

8.0168

8.0175

8.0169

8.0171

8.0173

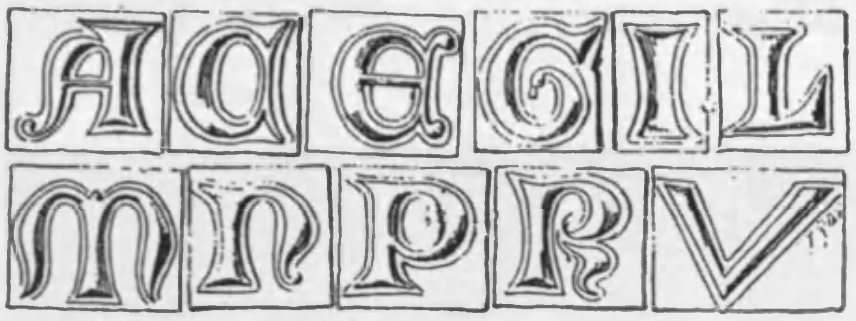
8.0172

8.0174

8.0176

8.0178

8.0179



8.0180

8.0177

8.0182

8.0183

8.0184

8.0181

8.0185

8.0186

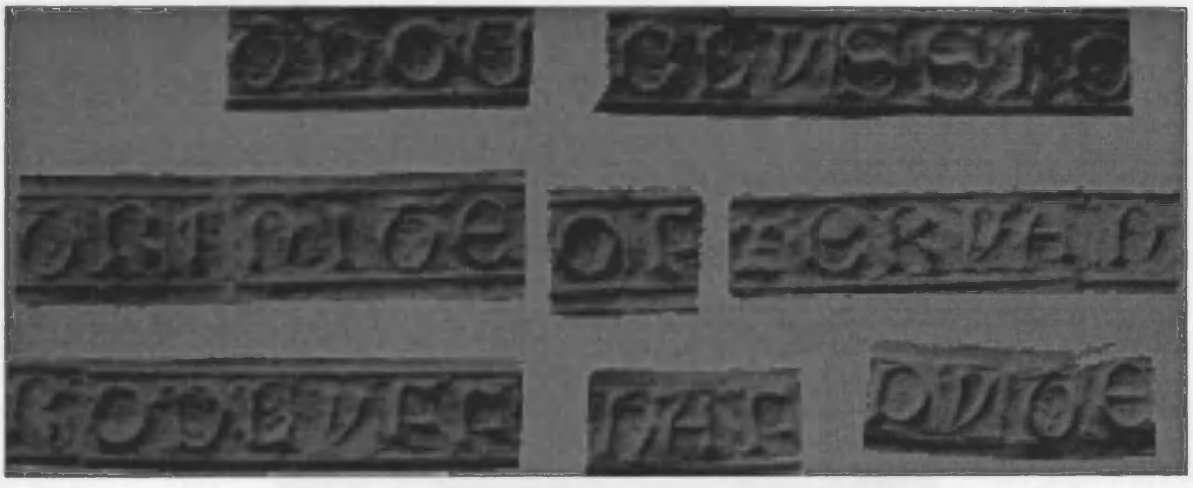
8.0189

8.0187

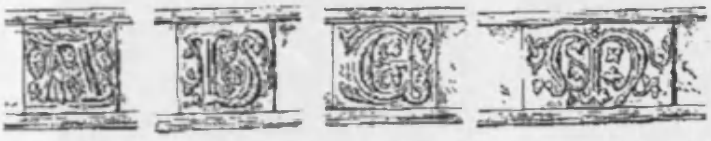
8.0188

8.0190

8.0191

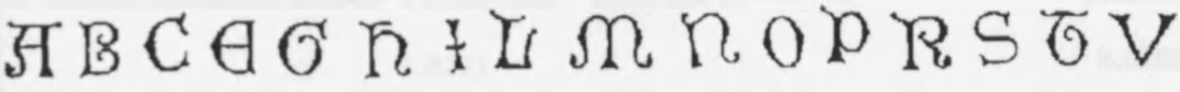


8.0192

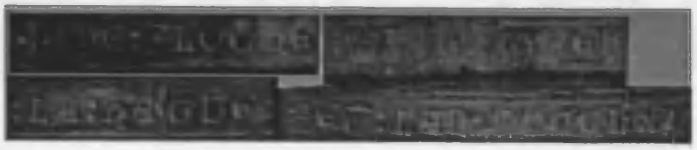


8.0193

8.0194



8.0195



8.0196

8.0197

8.0198

8.0199

8.0200

8.0204

8.0201

8.0205

8.0202

8.0203

8.0206

8.0207

8.0208

8.0209

8.0215

8.0210

8.0213

8.0211

8.0212

8.0214

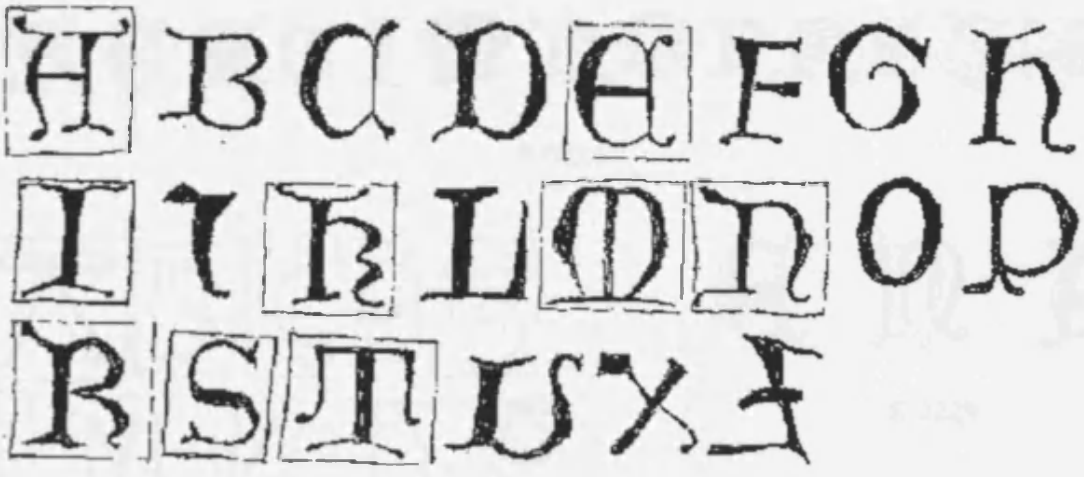
8.0216

8.0217

8.0218

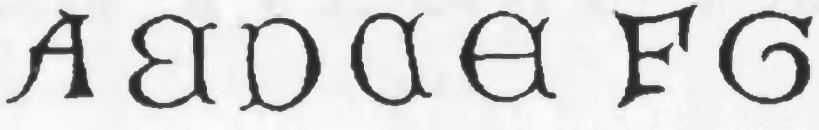
8.0219

8.0220



8.0221

8.0222

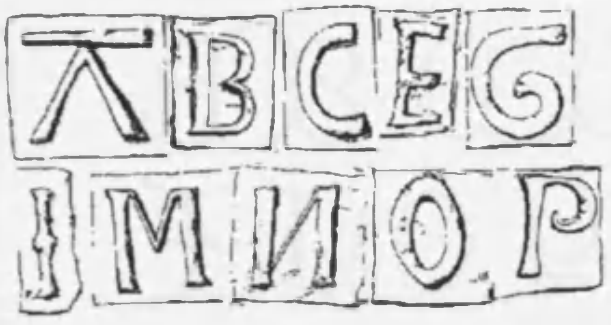


8.0223

8.0224

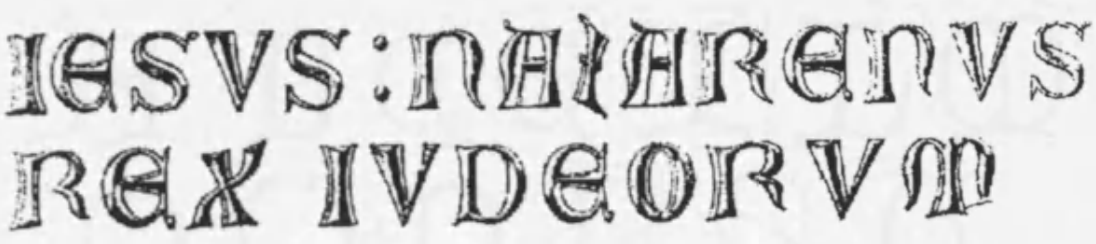
8.0225

8.0226



8.0227

8.0229



8.0228

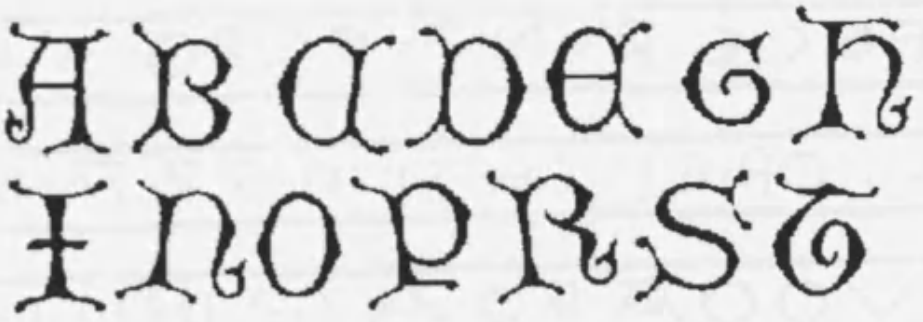
8.0230

8.0232

8.0231

8.0233

8.0235



8.0234

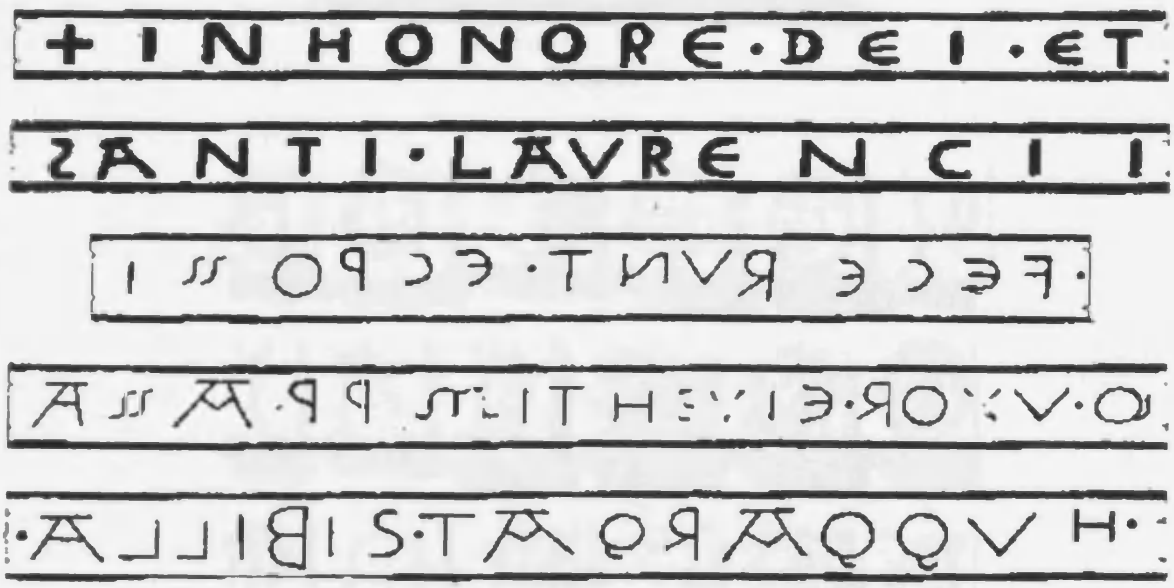
8.0236

8.0237

8.0238

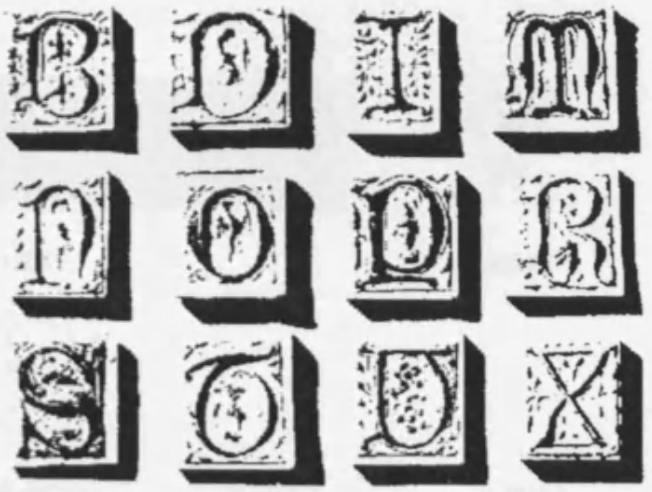
8.0239

8.0240



8.0241

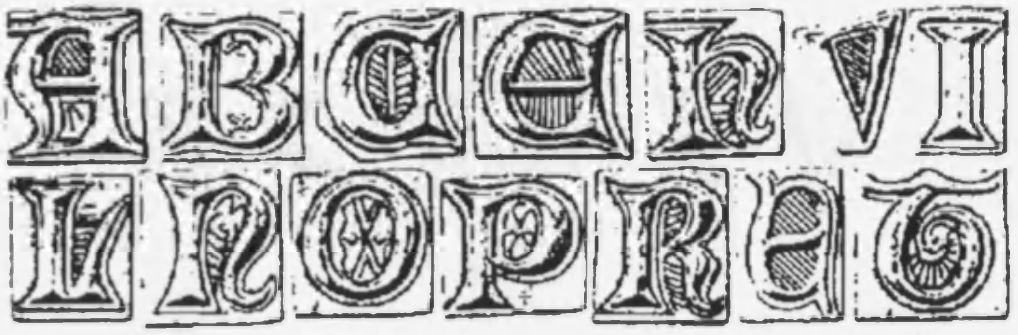
8.0242



8.0243

8.0244

8.0245



8.0246

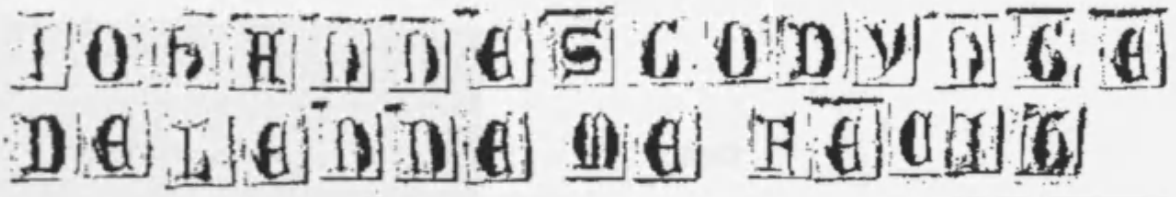
8.0247

8.0248

8.0249

8.0250 8.0251 8.0252 8.0253 8.0254

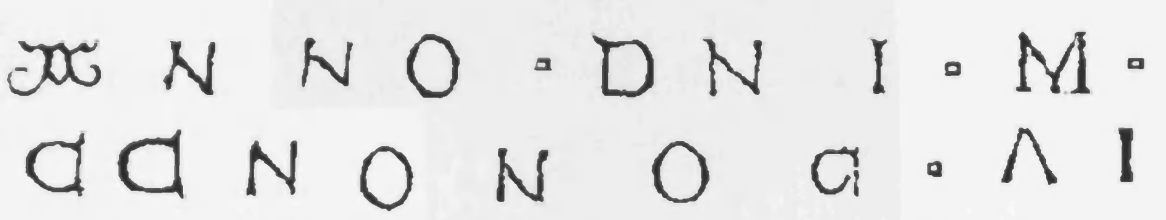
8.0255 8.0256 8.0257 8.0261



8.0258

8.0259

8.0260



8.0262

8.0263

8.0265

8.0264

8.0266

8.0267

8.0269

8.0268

8.0270

8.0271

8.0272

APPENDIX 2
PRE-REFORMATION BELLS FROM ENGLAND

This catalogue of medieval bells relates to the units of the incidence matrix used in this study (Appendix 3). All known bells are listed, including those without any marks or where the marks are not known. Consequently not all the bells listed here appear in the incidence matrix. Bells are listed by the unit number which appears in the incidence matrix, and then described by parish name, county, and dedication of the church in which they are situated. Bells are not listed in alphabetical order by parish. They are then characterised by their place in the ring and the number of bells in that ring. These details relate to the first mention of a medieval bell in the literature and take no account of subsequent augmentation, recasting, or movements between towers.

0001 Bedford, Bedfordshire (St Mary) 4 (of 6)
0002 Campton, Bedfordshire (All Saints) 2 (of 4)
0003 Campton, Bedfordshire (All Saints) 3 (of 4)
0004 Carlton, Bedfordshire (St Mary) 3 (of 4)
0005 Carlton, Bedfordshire (St Mary) 4 (of 4)
0006 Chalgrave, Bedfordshire (All Saints) 1 (of 3)
0007 Chellington, Bedfordshire (St Nicholas) 4 (of 4)
0008 Cople, Bedfordshire (All Saints) 2 (of 5)
0009 Cople, Bedfordshire (All Saints) 4 (of 5)
0010 Dean, Bedfordshire (All Saints) 2 (of 4)
0011 Dunstable, Bedfordshire (SS Peter & Paul) Sanctus bell (of 8)
0012 Edworth, Bedfordshire (St George) 3 (of 3)
0013 Eyeworth, Bedfordshire (All Saints) 1 (of 2)
0014 Harlington, Bedfordshire (St Mary) 4 (of 5)
0015 Haynes, Bedfordshire (St Mary) 3 (of 4)
0016 Hockcliffe, Bedfordshire (St Nicholas) 1 (of 3)
0017 Hockcliffe, Bedfordshire (St Nicholas) 2 (of 3)
0018 Hockcliffe, Bedfordshire (St Nicholas) 3 (of 3)
0019 Houghton Conquest, Bedfordshire (All Saints) 3 (of 5)
0020 Houghton Conquest, Bedfordshire (All Saints) 5 (of 5)
0021 Kempston, Bedfordshire (All Saints) 4 (of 5)
0022 Leighton Buzzard, Bedfordshire (All Saints) Priest's bell (of 8)
0023 Lidlington, Bedfordshire (St Margaret) Priest's bell (of 5)
0024 Lidlington, Bedfordshire (St Margaret) 4 (of 5)
0025 Maulden, Bedfordshire (St Mary) 1 (of 5)
0026 Meppershall, Bedfordshire (St Mary) 3 (of 5)
0027 Millbrooke, Bedfordshire (St Michael) 1 (of 2)
0028 Northill, Bedfordshire (St Mary) 1 (of 5)
0029 Old Warden, Bedfordshire (St Andrew) 2 (of 4)
0030 Old Warden, Bedfordshire (St Andrew) 3 (of 4)
0031 Pottesgrave, Bedfordshire (St Mary) 1 (of 3)
0032 Salford, Bedfordshire (St Mary) 3 (of 3)
0033 Souldrop, Bedfordshire (All Saints) ? (of 2)
0034 Staughton Parva, Bedfordshire (All Saints) 3 (of 5)
0035 Stotfold, Bedfordshire (St Mary) 2 (of 3)
0036 Sundon, Bedfordshire (St Mary) 1 (of 1)
0037 Thurleigh, Bedfordshire (St Peter) 5 (of 5)
0038 Thurleigh, Bedfordshire (St Peter) 4 (of 5)
0039 Tingrith, Bedfordshire (St Nicholas) 3 (of 3)
0040 Wilden, Bedfordshire (St Nicholas) 2 (of 5)
0041 Willington, Bedfordshire (St Lawrence) 5 (of 5)
0042 Wymington, Bedfordshire (St Lawrence) 3 (of 6)
0043 Wymington, Bedfordshire (St Lawrence) 4 (of 6)
0044 Wymington, Bedfordshire (St Lawrence) 5 (of 6)
0045 Wymington, Bedfordshire (St Lawrence) 2 (of 6)
0046 Wymington, Bedfordshire (St Lawrence) 6 (of 6)
0047 Wymington, Bedfordshire (St Lawrence) Sanctus bell (of 6)
0048 Appleford, Berkshire (SS Peter & Paul) 2 (of 3)
0049 Appleford, Berkshire (SS Peter & Paul) 3 (of 3)
0050 Arborfield, Berkshire (St Bartholomew) 1 (of 5)
0051 Aston Tirrold, Berkshire (St Michael) 2 (of 5)
0052 Aston Tirrold, Berkshire (St Michael) Sanctus bell (of 5)
0053 Aston Upthorpe, Berkshire (All Saints) 1 (of 2)
0054 Avington, Berkshire (SS Mark & Lawrence) 1 (of 1)
0055 Besselsleigh, Berkshire (St Lawrence) 2 (of 2)

0056 Brightwaltham, Berkshire (All Saints) 2 (of 4)
0057 Buscot, Berkshire (St Mary) 2 (of 3)
0058 Chilton, Berkshire (All Saints) 4 (of 4)
0059 Cholsey, Berkshire (St Mary) Sanctus bell (of 8)
0060 Combe, Berkshire (St Swithin) 2 (of 3)
0061 Compton Beauchamp, Berkshire (St Swithin) 1 (of 1)
0062 Denchworth, Berkshire (St James) 3 (of 4)
0063 Didcot, Berkshire (All Saints) 1 (of 3)
0064 Didcot, Berkshire (All Saints) 2 (of 3)
0065 Drayton, Berkshire (St Peter) 3 (of 5)
0066 Drayton, Berkshire (St Peter) 4 (of 5)
0067 East Hendred, Berkshire (St Augustine of Canterbury) 4 (of 6)
0068 East Ilsley, Berkshire (St Mary) 2 (of 5)
0069 Enborne, Berkshire (St Michael) 1 (of 2)
0070 Farnborough, Berkshire (All Saints) 3 (of 5)
0071 Farnborough, Berkshire (All Saints) 5 (of 5)
0072 Farnborough, Berkshire (All Saints) Sanctus bell (of 5)
0073 Fawley, Berkshire (St Mary) 2 (of 2)
0074 Fyfield, Berkshire (St Nicholas) Sanctus bell (of 1)
0075 Hatford, Berkshire (St George) 1 (of 2)
0076 Hatford, Berkshire (St George) 2 (of 2)
0077 Hurley, Berkshire (St Mary the Virgin) 2 (of 3)
0078 Kingston Lisle, Berkshire (St John the Baptist) 1 (of 2)
0079 Leckhampstead, Berkshire (St James) 1 (of 1)
0080 Lockinge, Berkshire (All Saints) 3 (of 4)
0081 Marlston, Berkshire (St Mary) 1 (of 1)
0082 Midgham, Berkshire (St Matthew) 2 (of 2)
0083 North Moreton, Berkshire (All Saints) 4 (of 5)
0084 Remenham, Berkshire (St Nicholas) 1 (of 3)
0085 Ruscombe, Berkshire (St James) 1 (of 3)
0086 Sandhurst, Berkshire (St Michael) 3 (of 3)
0087 Shaw, Berkshire (St Mary) 1 (of 3)
0088 Shrivenham, Berkshire (St Andrew) Sanctus bell (of 8)
0089 Sonning, Berkshire (St Andrew) Sanctus bell (of ?)
0090 South Hinksey, Berkshire (St John) 1 (of 3)
0091 South Hinksey, Berkshire (St John) 2 (of 3)
0092 Sparsholt, Berkshire (The Holy Rood) 2 (of 4)
0093 Stanford Dingley, Berkshire (St Denis) 3 (of 4)
0094 Streatley, Berkshire (St Mary) Sanctus bell (of 6)
0095 Sulham, Berkshire (St Nicholas) 2 (of 4)
0096 Sunningwell, Berkshire (St Leonard) ? (of ?)
0097 Tidmarsh, Berkshire (St Lawrence) 3 (of 3)
0098 Waltham-St-Lawrence, Berkshire (St Lawrence) Sanctus bell (of 6)
0099 Warfield, Berkshire (St Michael & All Angels) 2 (of 5)
0100 Wasing, Berkshire (St Nicholas) 1 (of 2)
0101 West Challow, Berkshire (St Lawrence) 1 (of 2)
0102 Woolhampton, Berkshire (St Peter) 1 (of 3)
0103 Yattendon, Berkshire (SS Peter & Paul) 5 (of 6)
0104 Adstock, Buckinghamshire (St Cecilia) 1 (of 3)
0105 Aston Sandford, Buckinghamshire (St Michael) 1 (of 3)
0106 Aston Sandford, Buckinghamshire (St Michael) 3 (of 3)
0107 Astwood, Buckinghamshire (St Peter) 1 (of 3)
0108 Astwood, Buckinghamshire (St Peter) 2 (of 3)
0110 Barton Hartshorn, Buckinghamshire (St James) 1 (of 2)
0111 Barton Hartshorn, Buckinghamshire (St James) 2 (of 2)
0112 Beachampton, Buckinghamshire (Assumption of the Blessed Virgin Mary) 1 (of 3)
0113 Beachampton, Buckinghamshire (Assumption of the Blessed Virgin Mary) 2 (of 3)
0114 Boveney, Buckinghamshire (St Mary Magdalene) 3 (of 3)
0115 Bradenham, Buckinghamshire (St Botolph) 2 (of 3)
0116 Bradenham, Buckinghamshire (St Botolph) 3 (of 3)
0117 Broughton, Buckinghamshire (St Lawrence) 2 (of 4)
0118 Broughton, Buckinghamshire (St Lawrence) 4 (of 4)
0119 Castlethorpe, Buckinghamshire (SS Simon & Jude) 1 (of 1)
0120 Chearsley, Buckinghamshire (St Nicholas) 1 (of 3)
0121 Cheddington, Buckinghamshire (St Giles) 4 (of 5)
0122 Chesham, Buckinghamshire (St Mary) Sanctus bell (of 6)
0123 Chesham Bois, Buckinghamshire (St Leonard) 1 (of 3)
0124 Chesham Bois, Buckinghamshire (St Leonard) 3 (of 3)
0125 Chetwode, Buckinghamshire (SS Mary & Nicholas) 1 (of 1)
0126 Cuddington, Buckinghamshire (St Nicholas) 2 (of 5)
0127 Cuddington, Buckinghamshire (St Nicholas) 4 (of 5)
0128 Edgcott, Buckinghamshire (St Michael) 1 (of 3)

0129 Emberton, Buckinghamshire (All Saints) 1 (of 4)
0130 Emberton, Buckinghamshire (All Saints) 3 (of 4)
0131 Emberton, Buckinghamshire (All Saints) 4 (of 4)
0132 Fawley, Buckinghamshire (St Mary) 2 (of 3)
0133 Fawley, Buckinghamshire (St Mary) 3 (of 3)
0134 Foscot, Buckinghamshire (St Leonard) 1 (of 1)
0135 Fulmer, Buckinghamshire (St James) 1 (of 6)
0136 Granborough, Buckinghamshire (St John the Baptist) 5 (of 5)
0137 Great Horwood, Buckinghamshire (St James) 3 (of 5)
0138 Great Linford, Buckinghamshire (St Andrew) 3 (of 5)
0139 Great Linford, Buckinghamshire (St Andrew) 5 (of 5)
0140 Hambleden, Buckinghamshire (St Mary) 6 (of 6)
0141 Hanslope, Buckinghamshire (St James the Great) 5 (of 5)
0142 Hardmead, Buckinghamshire (St Mary) 1 (of 3)
0143 Hardmead, Buckinghamshire (St Mary) 2 (of 3)
0144 Hardmead, Buckinghamshire (St Mary) 3 (of 3)
0145 High Wycombe, Buckinghamshire (All Saints) 2 (of 6)
0146 Hitcham, Buckinghamshire (St Mary) 2 (of 3)
0147 Hoggeston, Buckinghamshire (Holy Cross) 2 (of 3)
0148 Hoggeston, Buckinghamshire (Holy Cross) Sanctus bell (of 3)
0149 Hughenden, Buckinghamshire (St Michael) 7 (of 8)
0150 Hughenden, Buckinghamshire (St Michael) 8 (of 8)
0151 Hulcott, Buckinghamshire (All Saints) 1 (of 3)
0152 Ilmer, Buckinghamshire (St Peter) 3 (of 3)
0153 Leckhampsted, Buckinghamshire (Assumption of the Blessed Virgin Mary) 1 (of 3)
0154 Leckhampsted, Buckinghamshire (Assumption of the Blessed Virgin Mary) Sanctus bell (of 3)
0155 Lee, Buckinghamshire (St John the Baptist) 1 (of 1)
0156 Little Linford, Buckinghamshire (St Leonard) 1 (of 2)
0157 Little Linford, Buckinghamshire (St Leonard) 2 (of 2)
0158 Little Missendon, Buckinghamshire (St John the Baptist) 2 (of 5)
0159 Little Missendon, Buckinghamshire (St John the Baptist) 3 (of 5)
0160 Long Crendon, Buckinghamshire (Blessed Virgin Mary) 2 (of 5)
0161 Loughton, Buckinghamshire (All Saints) 2 (of 4)
0162 Loughton, Buckinghamshire (All Saints) 3 (of 4)
0163 Maids' Moreton, Buckinghamshire (St Edmund the King) 1 (of 3)
0164 Maids' Moreton, Buckinghamshire (St Edmund the King) 2 (of 3)
0165 Moulsoe, Buckinghamshire (Assumption of the Blessed Virgin Mary) 4 (of 4)
0166 Nettledon, Buckinghamshire (St Lawrence) 3 (of 3)
0167 Old Bradwell, Buckinghamshire (St Lawrence) 1 (of 4)
0168 Old Bradwell, Buckinghamshire (St Lawrence) 2 (of 4)
0169 Old Bradwell, Buckinghamshire (St Lawrence) 4 (of 4)
0170 Old Linslade, Buckinghamshire (St Mary) 2 (of 3)
0171 Old Linslade, Buckinghamshire (St Mary) 3 (of 3)
0172 Old Wolverton, Buckinghamshire (The Holy Trinity) 4 (of 4)
0173 Olney, Buckinghamshire (SS Peter & Paul) 4 (of 4)
0174 Radclive, Buckinghamshire (St John the Evangelist) 2 (of 3)
0175 Ravenstone, Buckinghamshire (All Saints) 2 (of 3)
0176 Shenley Mansel, Buckinghamshire (St Mary) 5 (of 5)
0177 Soulbury, Buckinghamshire (All Saints) 4 (of 6)
0178 Soulbury, Buckinghamshire (All Saints) 5 (of 6)
0179 Stantonbury, Buckinghamshire (SS Peter & Paul) 1 (of 1)
0180 Stoke Hamond, Buckinghamshire (St Luke) 2 (of 3)
0181 Stoke Hamond, Buckinghamshire (St Luke) 3 (of 3)
0182 Stoke Hamond, Buckinghamshire (St Luke) Sanctus bell (of 3)
0183 Stony Stratford, Buckinghamshire (St Giles) 5 (of 5)
0184 Tattenhoe, Buckinghamshire (St Giles) 1 (of 1)
0185 Thornborough, Buckinghamshire (St Mary) 1 (of 4)
0186 Thornborough, Buckinghamshire (St Mary) 3 (of 4)
0187 Thornborough, Buckinghamshire (St Mary) Sanctus bell (of 4)

0188 Thornton, Buckinghamshire (St Michael) 1 (of 3)
0189 Thornton, Buckinghamshire (St Michael) 3 (of 3)
0190 Tingewick, Buckinghamshire (St Mary Magdalene) 3 (of 5)
0191 Twyford, Buckinghamshire (Assumption of the Blessed Virgin Mary) 5 (of 6)
0192 Walton, Buckinghamshire (St Michael) 2 (of 2)
0193 Wavendon, Buckinghamshire (Assumption of the Blessed Virgin Mary) ? (of 4)
0194 Wavendon, Buckinghamshire (Assumption of the Blessed Virgin Mary) ? (of 4)
0195 Westbury, Buckinghamshire (St Augustine) Sanctus bell (of 3)
0196 Weston Turville, Buckinghamshire (St Mary) 2 (of 5)
0197 Weston Turville, Buckinghamshire (St Mary) 3 (of 5)
0198 Wingrave, Buckinghamshire (SS Peter & Paul) 6 (of 6)
0199 Wooburn, Buckinghamshire (St Paul) 2 (of 6)
0200 Balsham, Cambridgeshire (The Holy Trinity) 4 (of 5)
0201 Bartlow, Cambridgeshire (St Mary) 1 (of 3)
0202 Bartlow, Cambridgeshire (St Mary) 2 (of 3)
0203 Bartlow, Cambridgeshire (St Mary) 3 (of 3)
0204 Barway, Cambridgeshire (St Nicholas) 1 (of 2)
0205 Barway, Cambridgeshire (St Nicholas) 2 (of 2)
0206 Caldecot, Cambridgeshire (St Michael & All Angels) 1 (of 3)
0207 Caldecot, Cambridgeshire (St Michael & All Angels) 2 (of 3)
0208 Caldecot, Cambridgeshire (St Michael & All Angels) 3 (of 3)
0209 Cambridge, Cambridgeshire (All Saints) 1 (of 3)
0210 Cambridge, Cambridgeshire (Holy Sepulchre) Priest's bell (of 5)
0214 Cambridge, Cambridgeshire (St Botolph) 1 (of 4)
0215 Cambridge, Cambridgeshire (St Botolph) 2 (of 4)
0216 Cambridge, Cambridgeshire (St Botolph) 3 (of 4)
0217 Cambridge, Cambridgeshire (St Botolph) 4 (of 4)
0218 Cambridge, Cambridgeshire (St Edward the Confessor) 5 (of 6)
0219 Cambridge, Cambridgeshire (St Giles) 2 (of 5)
0220 Cambridge, Cambridgeshire (St Giles) 3 (of 5)
0221 Cambridge, Cambridgeshire (St Mary-the-great) 2 (of 8)
0222 Cambridge, Cambridgeshire (St Mary-the-great) 4 (of 8)
0223 Carleton, Cambridgeshire (St Peter) 1 (of 2)
0224 Carleton, Cambridgeshire (St Peter) 2 (of 2)
0225 Cherry Hinton, Cambridgeshire (St Andrew) 2 (of 5)
0226 Cherry Hinton, Cambridgeshire (St Andrew) 3 (of 5)
0227 Cherry Hinton, Cambridgeshire (St Andrew) 4 (of 5)
0228 Cheveley, Cambridgeshire (St Mary) 2 (of 5)
0229 Chippenham, Cambridgeshire (St Margaret) 3 (of 5)
0230 Chippenham, Cambridgeshire (St Margaret) 4 (of 5)
0231 Conington, Cambridgeshire (St Mary) 1 (of 4)
0232 Conington, Cambridgeshire (St Mary) 2 (of 4)
0233 Conington, Cambridgeshire (St Mary) 4 (of 4)
0234 Coton, Cambridgeshire (St Peter) 3 (of 3)
0235 Croxton, Cambridgeshire (St James) 5 (of 6)
0236 Elm, Cambridgeshire (All Saints) 3 (of 5)
0237 Eltisley, Cambridgeshire (SS Pandiona & John the Baptist) 3 (of 4)
0238 Ely, Cambridgeshire (The Holy Trinity) Priest's bell (of ?)
0239 Fulbourn, Cambridgeshire (St Vigor) 1 (of 2)
0240 Fulbourn, Cambridgeshire (St Vigor) 2 (of 2)
0241 Fulbourn, Cambridgeshire (St Vigor) Sanctus bell (of 2)
0242 Fulbourn, Cambridgeshire (St Vigor) ? (of ?)
0243 Girton, Cambridgeshire (St Andrew) Clockbell (of 4)
0244 Great Shelford, Cambridgeshire (St Mary) 2 (of 5)
0245 Great Shelford, Cambridgeshire (St Mary) 4 (of 5)
0246 Guilden Morden, Cambridgeshire (St Mary) 1 (of 6)
0247 Harston, Cambridgeshire (All Saints) 4 (of 4)
0248 Ickleton, Cambridgeshire (St Mary Magdalene) Clockbell (of 6)
0249 Impington, Cambridgeshire (St Andrew) 1 (of 3)
0250 Impington, Cambridgeshire (St Andrew) 2 (of 3)
0251 Isleham, Cambridgeshire (St Andrew) 1 (of 5)
0252 Isleham, Cambridgeshire (St Andrew) 2 (of 5)
0253 Isleham, Cambridgeshire (St Andrew) 3 (of 5)

0254 Isleham, Cambridgeshire (St Andrew) Clockbell (of 5)
0255 Kennett, Cambridgeshire (St Nicholas) 2 (of 3)
0256 Kennett, Cambridgeshire (St Nicholas) 3 (of 3)
0257 Kingston, Cambridgeshire (All Saints & St Andrew) 2 (of 3)
0258 Landbeach, Cambridgeshire (All Saints) 4 (of 4)
0259 Landwade, Cambridgeshire (St Nicholas) 2 (of 2)
0260 Linton, Cambridgeshire (St Mary) Clockbell (of 5)
0261 Little Gransden, Cambridgeshire (SS Peter & Paul) 1 (of 3)
0262 Little Gransden, Cambridgeshire (SS Peter & Paul) 2 (of 3)
0263 Long Stow, Cambridgeshire (St Mary) 1 (of 3)
0264 Madingley, Cambridgeshire (St Mary Magdalene) 1 (of 3)
0265 Newton, Cambridgeshire (St James) 2 (of 3)
0266 Newton, Cambridgeshire (St James) 3 (of 3)
0267 Rampton, Cambridgeshire (All Saints) 2 (of 3)
0268 Rampton, Cambridgeshire (All Saints) 3 (of 3)
0269 Shudy Camps, Cambridgeshire (St Mary) 5 (of 5)
0270 Snailwell, Cambridgeshire (St Peter) 3 (of 3)
0271 Stetchworth, Cambridgeshire (St Peter) 3 (of 5)
0272 Stetchworth, Cambridgeshire (St Peter) 4 (of 5)
0273 Tadlow, Cambridgeshire (St John the Baptist) 1 (of 1)
0276 Toft, Cambridgeshire (St Andrew) 2 (of 3)
0277 Toft, Cambridgeshire (St Andrew) 3 (of 3)
0278 Trumpington, Cambridgeshire (St Nicholas) 4 (of 5)
0279 West Wickham, Cambridgeshire (St Mary) 4 (of 5)
0280 West Wratting, Cambridgeshire (St Andrew) santuary bell (of 1)
0281 Wicken, Cambridgeshire (St Lawrence) 3 (of 5)
0282 Wood Ditton, Cambridgeshire (St Mary) 3 (of 5)
0283 Bunbury, Cheshire (St Boniface) 6 (of 6)
0285 Dodleston, Cheshire (St Mary) 3 (of 4)
0286 Frodsham, Cheshire (St Lawrence) 1 (of ?)
0287 Handley, Cheshire (All Saints) 4 (of 4)
0288 Henbury, Cheshire (St Thomas) ? (of ?)
0289 Malpas, Cheshire (St Oswald) 1 (of 5)
0290 Malpas, Cheshire (St Oswald) 5 (of 5)
0291 Pott Shringley, Cheshire (St Christopher) 1 (of ?)
0292 Pott Shringley, Cheshire (St Christopher) 2 (of ?)
0293 Cornelly, Cornwall (St Cornelius) 1 (of 2)
0294 Cornelly, Cornwall (St Cornelius) 2 (of 2)
0296 Creed, Cornwall (St Crida the Virgin) 1 (of 3)
0297 Creed, Cornwall (St Crida the Virgin) 2 (of 3)
0300 St Grade, Cornwall (St Grade & Holy Cross) 3 (of 3)
0301 Gunwalloe, Cornwall (St Winwalloe) 1 (of 3)
0302 Gunwalloe, Cornwall (St Winwalloe) 2 (of 3)
0303 Gunwalloe, Cornwall (St Winwalloe) 3 (of 3)
0304 Landewednack, Cornwall (St Winwalloe) 1 (of 3)
0305 Landewednack, Cornwall (St Winwalloe) 2 (of 3)
0306 Landewednack, Cornwall (St Winwalloe) 3 (of 3)
0307 Lanhydrock, Cornwall (St Hyderock) Service bell (of 1)
0308 Lansallos, Cornwall (SS Ildierna & Alwys) 1 (of 3)
0309 Little Petherick, Cornwall (St Petrock Minor) 2 (of 3)
0310 Little Petherick, Cornwall (St Petrock Minor) 3 (of 3)
0311 St Mawgan In Pyder, Cornwall (SS Mawgan & Nicholas) 2 (of 3)
0313 Michaelstow, Cornwall (St Michael & All Angels) 1 (of 3)
0314 Mylor, Cornwall (St Melonis (Or Mellyr)) 1 (of 3)
0315 Otterham, Cornwall (SS Denis & Tange) 1 (of 3)
0316 Otterham, Cornwall (SS Denis & Tange) 3 (of 3)
0317 Perranarworthal, Cornwall (St Pirran) 2 (of 3)
0318 Rame, Cornwall (St Germanus) 1 (of 3)
0319 St Allen, Cornwall (St Alunus) 1 (of 3)
0320 St Anthony In Meneage, Cornwall (St Anthony) 3 (of 3)
0321 St Clement, Cornwall (St Clement) 1 (of 3)
0322 St Clement, Cornwall (St Clement) 2 (of 3)
0323 St Clether, Cornwall (St Clederus) 2 (of 4)
0324 St Clether, Cornwall (St Clederus) 3 (of 4)
0325 St Colan, Cornwall (St Colanus) 1 (of 3)
0326 St Dennis, Cornwall (St Dionysius) 2 (of 3)
0327 St Erney, Cornwall (St Terinus) 1 (of 3)
0328 St Ervan, Cornwall (St Hermes) 1 (of 3)
0329 St John, Cornwall (St John the Evangelist) 1 (of 3)
0332 St Kea, Cornwall (All Hallows Or St Keus) 3 (of 3)

0334 St Michael Carhayes, Cornwall (St Michael) 1 (of 3)
0335 St Michael Carhayes, Cornwall (St Michael) 2 (of 3)
0336 St Michael Carhayes, Cornwall (St Michael) 3 (of 3)
0337 St Michael Penkivel, Cornwall (St Michael) 2 (of 4)
0338 St Michaels Mount, Cornwall (St Michael) 4 (of 6)
0339 St Michaels Mount, Cornwall (St Michael) 5 (of 6)
0340 St Michaels Mount, Cornwall (St Michael) 2 (of 6)
0341 Towednack, Cornwall (St Trewinnock the Confessor) 3 (of 3)
0342 Tremayne, Cornwall (St Winwalloe) 2 (of 2)
0344 Tresmere, Cornwall (St Nicholas) 1 (of 3)
0345 Tresmere, Cornwall (St Nicholas) 2 (of 3)
0346 Trevalgar, Cornwall (St Petrock) 1 (of 3)
0348 Zennor, Cornwall (St Senara the Virgin) 2 (of 3)
0349 Zennor, Cornwall (St Senara the Virgin) 3 (of 3)
0350 Aikton, Cumberland (St Andrew) 1 (of 2)
0351 Aikton, Cumberland (St Andrew) 2 (of 2)
0352 Bowness-on-Solway, Cumberland (St Michael) 2 (of 2)
0353 Brigham, Cumberland (St Bridget) 2 (of 3)
0354 Burgh-by-Sands, Cumberland (St Michael) 1 (of 2)
0355 Burgh-by-Sands, Cumberland (St Michael) 2 (of 2)
0358 Castle Sowerby, Cumberland (St Mungo (Kentigern)) 2 (of 2)
0359 Cumrew, Cumberland (St Mary) 1 (of 2)
0360 Dacre, Cumberland (St Andrew) 2 (of 3)
0361 Dacre, Cumberland (St Andrew) 3 (of 3)
0362 Distington, Cumberland (unknown) 1 (of 2)
0363 Distington, Cumberland (unknown) 2 (of 2)
0364 Edenhall, Cumberland (St Cuthbert) 1 (of 3)
0365 Edenhall, Cumberland (St Cuthbert) 3 (of 3)
0366 Egglescliffe, Cumberland (St John or St Mary the Virgin) ? (of 3)
0367 Egremont, Cumberland (SS Mary & John) 1 (of 1)
0369 Ennerdale, Cumberland (St Bees) 1 (of ?)
0370 Eskdale, Cumberland (St Katherine) 1 (of 2)
0373 Greystoke, Cumberland (St Andrew) 1 (of 4)
0374 Greystoke, Cumberland (St Andrew) 2 (of 4)
0375 Greystoke, Cumberland (St Andrew) 3 (of 4)
0376 Greystoke, Cumberland (St Andrew) 4 (of 4)
0377 Holme Cultram, Cumberland (St Mary) 1 (of 2)
0378 Isel, Cumberland (St Michael & All Angels) 1 (of 2)
0379 Isel, Cumberland (St Michael & All Angels) 2 (of 2)
0380 Kirkland, Cumberland (St Lawrence) 1 (of 2)
0381 Lamplugh, Cumberland (St Michael) 2 (of 2)
0382 Langwathby, Cumberland (St Peter) 1 (of 2)
0383 Langwathby, Cumberland (St Peter) 2 (of 2)
0384 Loweswater, Cumberland (St Bartholomew) 1? (of 1?)
0385 Moresby, Cumberland (St Bridget) 1 (of ?)
0386 Moresby, Cumberland (St Bridget) 2 (of ?)
0387 Muncaster, Cumberland (St Michael) 2 (of ?)
0388 Newton Reigny, Cumberland (St John) 2 (of 2)
0389 Old Beckermet, Cumberland (St Bridget) 1 (of 2)
0390 Old Beckermet, Cumberland (St Bridget) 2 (of 2)
0391 Over Denton, Cumberland (St Cuthbert) 1 (of 1)
0392 Penrith, Cumberland (St Andrew) 5 (of 5)
0393 Redmarshall, Cumberland (St Cuthbert) 1 (of 3)
0394 Redmarshall, Cumberland (St Cuthbert) 2 (of 3)
0395 Redmarshall, Cumberland (St Cuthbert) 3 (of 3)
0396 Renwick, Cumberland (All Saints) 1 (of 2)
0397 Renwick, Cumberland (All Saints) 2 (of 2)
0398 Scaleby, Cumberland (All Saints) 1 (of 2)
0399 Scaleby, Cumberland (All Saints) 2 (of 2)
0400 Skelton, Cumberland (St Michael) 1 (of 2)
0401 Skelton, Cumberland (St Michael) 2 (of 2)
0402 Threlkeld, Cumberland (St Mary) 1 (of 2)
0403 Threlkeld, Cumberland (St Mary) 2 (of 2)
0404 Waberthwaite, Cumberland (St James) 1 (of 2)
0405 Waberthwaite, Cumberland (St James) 2 (of 2)
0406 Whicham, Cumberland (St Mary) 1 (of 2)
0407 Whicham, Cumberland (St Mary) 2 (of 2)
0408 Alvaston, Derbyshire (St Michael & All Angels) 1 (of 2)
0410 Ballidon, Derbyshire (All Saints) 1 (of 1)
0411 Barlborough, Derbyshire (St James) 4 (of 5)
0412 Barlborough, Derbyshire (St James) 5 (of 5)
0413 Barrow-on-Trent, Derbyshire (St Wilfrid) 2 (of 3)
0414 Barrow-on-Trent, Derbyshire (St Wilfrid) 3 (of 3)
0415 Baslow, Derbyshire (St Anne) 3 (of 6)
0416 Beeley, Derbyshire (St Anne) 2 (of 3)
0417 Beeley, Derbyshire (St Anne) 3 (of 3)
0418 Blackwell, Derbyshire (St Werbergh) 3 (of 3)
0419 Breaston, Derbyshire (St Michael) 3 (of 3)
0420 Bretby, Derbyshire (St Wystan) 2 (of 2)
0421 Calke, Derbyshire (St Giles) 1 (of 1)
0422 Chaddesden, Derbyshire (St Mary) 1 (of 3)

0423 Chesterfield, Derbyshire (St Mary & All Saints) 8 (of 8)
0424 Croxall, Derbyshire (St John the Baptist) 1 (of 1)
0425 Cubley, Derbyshire (St Andrew) 2 (of 4)
0426 Cubley, Derbyshire (St Andrew) 3 (of 4)
0427 Denby, Derbyshire (St Mary the Virgin) 2 (of 4)
0428 Derby, Derbyshire (All Saints) 10 (of 10)
0429 Edlaston, Derbyshire (St James) 1 (of 2)
0430 Egginton, Derbyshire (St Wilfrid) 2 (of 3)
0431 Etwall, Derbyshire (St Helen) 3 (of 3)
0432 Hathersage, Derbyshire (St Michael) 4 (of 6)
0433 Hathersage, Derbyshire (St Michael) Sanctus bell (of 6)
0434 Hognaston, Derbyshire (St Bartholomew) 1 (of 2)
0435 Kirk Halam, Derbyshire (All Saints) 3 (of 3)
0436 Kniveton, Derbyshire (St Michael) 2 (of 2)
0437 Long Eaton, Derbyshire (St Lawrence) 3 (of 3)
0438 Marston-on-Dove, Derbyshire (St Mary) 1 (of 4)
0439 Matlock, Derbyshire (St Giles) 5 (of 6)
0440 Measham, Derbyshire (St Lawrence) 4 (of 4)
0441 Monyash, Derbyshire (St Leonard) 2 (of 3)
0442 Morley, Derbyshire (St Matthew) 1 (of 3)
0443 Morley, Derbyshire (St Matthew) 2 (of 3)
0444 Morton, Derbyshire (Holy Cross) 3 (of 3)
0445 Mugginton, Derbyshire (St John) 3 (of 4)
0446 Mugginton, Derbyshire (St John) 4 (of 4)
0447 Newton Solney, Derbyshire (St Mary) 2 (of 3)
0448 Norbury, Derbyshire (Blessed Virgin Mary) 2 (of 3)
0449 North Wingfield, Derbyshire (St Lawrence) 5 (of 6)
0450 Pentrich, Derbyshire (St Matthew) 4 (of 5)
0451 Pleasley, Derbyshire (St Michael) 1 (of 3)
0452 Radbourne, Derbyshire (St Andrew) 1 (of 3)
0453 Ravenstone, Derbyshire (St Michael) 3 (of 3)
0454 Repton, Derbyshire (St Wystan) 4 (of 6)
0455 Repton, Derbyshire (St Wystan) 5 (of 6)
0456 Repton, Derbyshire (St Wystan) 6 (of 6)
0457 Scarcliffe, Derbyshire (St Leonard) 1 (of 4)
0458 Scarcliffe, Derbyshire (St Leonard) 3 (of 4)
0459 Scarcliffe, Derbyshire (St Leonard) 4 (of 4)
0460 Shirland, Derbyshire (St Leonard) 5 (of 6)
0461 Shirley, Derbyshire (St Michael) 2 (of 3)
0462 South Normanton, Derbyshire (St Michael) 5 (of 6)
0463 Spondon, Derbyshire (St Werbergh) 2 (of 5)
0464 Stanton-by-Dale-Abbey, Derbyshire (St Michael & All Angels) 2 (of 4)
0466 Sutton-on-the-Hill, Derbyshire (St Michael) 3 (of 3)
0467 Sutton Scarsdale, Derbyshire (St Mary) 1 (of 4)
0468 Sutton Scarsdale, Derbyshire (St Mary) 3 (of 4)
0469 Taddington, Derbyshire (St Michael) 2 (of 3)
0470 Taddington, Derbyshire (St Michael) 3 (of 3)
0471 Thorpe, Derbyshire (St Leonard) 2 (of 3)
0472 Tibshelf, Derbyshire (St John the Baptist) 4 (of 5)
0473 Tideswell, Derbyshire (St John the Baptist) 4 (of 6)
0474 Trusley, Derbyshire (All Saints) 1 (of 1)
0475 Twyford, Derbyshire (St Andrew) 1 (of 3)
0476 Walton-on-Trent, Derbyshire (St Lawrence) 2 (of 3)
0477 Wilne, Derbyshire (St Chad) 2 (of 4)
0478 Abbots Bickington, Devon (St James) 1 (of 3)
0479 Abbots Bickington, Devon (St James) 2 (of 3)
0480 Abbotsham, Devon (St Helen) 2 (of 4)
0481 Alverdiscott, Devon (All Saints) 2 (of 3)
0482 Alverdiscott, Devon (All Saints) 3 (of 3)
0483 Alwington, Devon (St Andrew) 1 (of 4)
0484 Alwington, Devon (St Andrew) 2 (of 4)
0485 Alwington, Devon (St Andrew) 4 (of 4)
0486 Ashbury, Devon (St Mary) 1 (of 3)
0487 Ashbury, Devon (St Mary) 3 (of 3)
0488 Ashcombe, Devon (St Nectanus) 2 (of 3)
0489 Ashford, Devon (St Peter) 1 (of 2)
0490 Ashford, Devon (St Peter) 2 (of 2)
0491 Awliscombe, Devon (SS Mary & Michael) 2 (of 5)
0492 Awliscombe, Devon (SS Mary & Michael) 3 (of 5)
0493 Aylesbeare, Devon (St Mary) 1 (of 3)
0494 Beaford, Devon (St George & All Angels) 1 (of 3)
0495 Beaford, Devon (St George & All Angels) 2 (of 3)
0496 Beer, Devon (St Michael) 1 (of 1)
0497 Brendon, Devon (St Brendonus) 2 (of 4)
0498 Brendon, Devon (St Brendonus) 3 (of 4)
0499 Brendon, Devon (St Brendonus) 4 (of 4)
0500 Brent Tor, Devon (St Michael) 1 (of 3)
0501 Brent Tor, Devon (St Michael) 2 (of 3)
0502 Bridford, Devon (St Thomas of Canterbury) 2 (of 4)
0503 Broadhembury, Devon (St Andrew) 1 (of 5)
0504 Brushford, Devon (St Mary) 1 (of 3)
0505 Brushford, Devon (St Mary) 2 (of 3)
0506 Brushford, Devon (St Mary) 3 (of 3)
0507 Buckerel, Devon (St Mary) 1 (of 3)
0508 Buckerel, Devon (St Mary) 2 (of 3)
0509 Buckerel, Devon (St Mary) 3 (of 3)
0510 Buckland Egg, Devon (St Edward) 1 (of 3)
0511 Bulkworthy, Devon (unknown) 1 (of 3)
0512 Bulkworthy, Devon (unknown) 2 (of 3)
0513 Bondleigh, Devon (St James) 2 (of 4)

0514 Bondleigh, Devon (St James) 3 (of 4)
0516 Cadbury, Devon (St Michael) 2 (of 4)
0517 Cadbury, Devon (St Michael) 4 (of 4)
0518 Calverleigh, Devon (St Mary) 2 (of 3)
0519 Challacombe, Devon (The Holy Trinity & St Mary) 3 (of 4)
0520 Challacombe, Devon (The Holy Trinity & St Mary) 4 (of 4)
0521 Churston Ferrers, Devon (St Mary the Virgin) 2 (of 4)
0522 Churston Ferrers, Devon (St Mary the Virgin) 3 (of 4)
0523 Churston Ferrers, Devon (St Mary the Virgin) 4 (of 4)
0524 Clannaborough, Devon (St Petrock) 1 (of 3)
0525 Clannaborough, Devon (St Petrock) ? (of 3)
0528 Clyst St George, Devon (St George) 3 (of 6)
0529 Clyst St George, Devon (St George) 4 (of 6)
0530 Clyst St George, Devon (St George) 5 (of 6)
0531 Clyst St Mary, Devon (St Mary) 1 (of 3)
0532 Clyst St Mary, Devon (St Mary) 3 (of 3)
0533 Coffinswell, Devon (St Bartholomew) 1 (of 4)
0534 Coffinswell, Devon (St Bartholomew) 2 (of 4)
0535 Colaton Raleigh, Devon (St John the Baptist) 1 (of 3)
0536 Colaton Raleigh, Devon (St John the Baptist) 2 (of 3)
0537 Colaton Raleigh, Devon (St John the Baptist) 3 (of 3)
0538 Combe In Teignhead, Devon (unknown) 2 (of 4)
0539 Combe In Teignhead, Devon (unknown) 4 (of 4)
0540 Combe Pyne, Devon (St Mary) 2 (of 3)
0541 Combe Pyne, Devon (St Mary) 3 (of 3)
0542 Combe Raleigh, Devon (St Nicholas) 2 (of 3)
0543 Cookbury, Devon (St John the Baptist & The Seven Maccabees) 1 (of 3)
0544 Coryton, Devon (St Andrew) 3 (of 3)
0545 Culmstock, Devon (All Saints) 3 (of 6)
0546 Dalwood, Devon (St Peter) 1 (of 5)
0547 Dalwood, Devon (St Peter) 5 (of 5)
0548 Dartington, Devon (St Mary) 3 (of 5)
0549 Dartington, Devon (St Mary) 5 (of 5)
0550 Denbury, Devon (St Mary) 3 (of 5)
0551 Dunchideock, Devon (The Holy Trinity) 2 (of 3)
0552 Dunchideock, Devon (The Holy Trinity) 3 (of 3)
0553 Dunterton, Devon (All Saints) 3 (of 3)
0554 East Anstey, Devon (St Michael) 1 (of 4)
0555 East Anstey, Devon (St Michael) 2 (of 4)
0556 East Anstey, Devon (St Michael) 4 (of 4)
0557 East Down, Devon (St John the Baptist) 4 (of 4)
0558 East Portlemouth, Devon (St Onolaus) 3 (of 3)
0559 East Teignmouth, Devon (St Michael) 1 (of 3)
0560 East Teignmouth, Devon (St Michael) 2 (of 3)
0561 East Teignmouth, Devon (St Michael) 3 (of 3)
0563 Exeter, Devon (St Lawrence) 1 (of 1)
0564 Exeter, Devon (St Mary Arches) 1 (of 3)
0565 Exeter, Devon (St Mary Arches) 2 (of 3)
0566 Exeter, Devon (St Olaf, King of Norway) 1 (of 2)
0567 Exeter, Devon (St Pancras) 1 (of 1)
0568 Exeter, Devon (St Petrock) 3 (of 6)
0569 Farway, Devon (St Michael) 3 (of 3)
0570 Fen Ottery, Devon (St Gregory) 3 (of 3)
0571 Fremington, Devon (All Saints) 1 (of 4)
0572 Fremington, Devon (All Saints) 2 (of 4)
0573 Frithelstock, Devon (St Gregory) 1 (of 4)
0574 Frithelstock, Devon (St Gregory) 2 (of 4)
0575 Germansweek, Devon (St Gernelius) 1 (of 3)
0576 Gidleigh, Devon (The Holy Trinity) 1 (of 4)
0577 Gidleigh, Devon (The Holy Trinity) 3 (of 4)
0578 Gidleigh, Devon (The Holy Trinity) 4 (of 4)
0579 Haccombe, Devon (St Blaise) 1 (of 1)
0580 Denbury, Devon (St Mary) 1 (of 3)
0581 Denbury, Devon (St Mary) 2 (of 3)
0582 Heavitree, Devon (St Michael) 2 (of 4)
0583 Hennock, Devon (St Mary) 1 (of 4)
0584 Hennock, Devon (St Mary) 3 (of 4)
0585 Highampton, Devon (Holy Cross) 1 (of 3)
0586 Highampton, Devon (Holy Cross) 2 (of 3)
0587 Highampton, Devon (Holy Cross) 3 (of 3)
0588 Highbray, Devon (All Saints) 1 (of 4)
0589 Highbray, Devon (All Saints) 2 (of 4)
0590 Highbray, Devon (All Saints) 3 (of 4)
0591 Hittisleigh, Devon (St Andrew) 2 (of 3)
0592 Hittisleigh, Devon (St Andrew) 3 (of 3)
0593 Holcombe Burnell, Devon (St John the Baptist) 2 (of 4)
0594 Holcombe Burnell, Devon (St John the Baptist) 3 (of 4)
0595 Holcombe Rogus, Devon (All Saints) 1 (of 5)
0596 Honeychurch, Devon (St Mary) 1 (of 3)
0597 Honeychurch, Devon (St Mary) 2 (of 3)
0598 Honeychurch, Devon (St Mary) 3 (of 3)
0599 Horwood, Devon (St Michael) 1 (of 3)
0600 Horwood, Devon (St Michael) 2 (of 3)
0601 Huish, Devon (St James) 1 (of 3)
0602 Huish, Devon (St James) 2 (of 3)
0603 Huish, Devon (St James) 3 (of 3)
0604 Huntsham, Devon (St Mary Magdalene) 4 (of 6)
0605 Huntshaw, Devon (St Mary Magdalene) 3 (of 3)
0606 Iddesleigh, Devon (St James) 4 (of 4)
0607 Ideford, Devon (SS Mary & Martin) 1 (of 3)

0608 Ideford, Devon (SS Mary & Martin) 2 (of 3)
0609 Instow, Devon (St John the Baptist) 1 (of 3)
0610 Jacobstowe, Devon (St James) 2 (of 4)
0611 Jacobstowe, Devon (St James) 3 (of 4)
0612 Kennerleigh, Devon (St Clement) 1 (of 3)
0613 Kennerleigh, Devon (St Clement) 2 (of 3)
0614 Kennerleigh, Devon (St Clement) 3 (of 3)
0615 Kingston, Devon (St James the Apostle) 2 (of 4)
0616 Kingswear, Devon (St Thomas of Canterbury) 1 (of 3)
0617 Knowstone, Devon (SS Peter & Andrew) 1 (of 3)
0618 Knowstone, Devon (SS Peter & Andrew) 3 (of 3)
0619 Littleham, Devon (St Swithin) 3 (of 4)
0620 Littleham, Devon (St Swithin) 4 (of 4)
0621 Little Hempston, Devon (St John the Baptist) 3 (of 5)
0622 Little Hempston, Devon (St John the Baptist) 4 (of 5)
0626 Luffincott, Devon (St James) 1 (of 3)
0627 Luffincott, Devon (St James) 2 (of 3)
0628 Luppit, Devon (St Mary) 1 (of 4)
0629 Luppit, Devon (St Mary) 3 (of 4)
0630 Luppit, Devon (St Mary) 4 (of 4)
0631 Lynton, Devon (St Mary) 1 (of 3)
0632 Lynton, Devon (St Mary) 3 (of 3)
0633 Manaton, Devon (St Winifred) 2 (of 4)
0634 Manaton, Devon (St Winifred) 3 (of 4)
0635 Manaton, Devon (St Winifred) 4 (of 4)
0636 Marldon, Devon (St John the Baptist) 3 (of 5)
0637 Martinhoe, Devon (St Martin) 1 (of 2)
0638 Martinhoe, Devon (St Martin) 2 (of 2)
0639 Membury, Devon (St John the Baptist) 2 (of 5)
0640 Membury, Devon (St John the Baptist) 3 (of 5)
0641 Meeth, Devon (St Michael) 2 (of 4)
0642 Meeth, Devon (St Michael) 3 (of 4)
0643 Merton, Devon (St Martin) 2 (of 6)
0644 Molland Bottreaux, Devon (St Mary) 2 (of 4)
0645 Molland Bottreaux, Devon (St Mary) 4 (of 4)
0646 Monkleigh, Devon (St George) 3 (of 5)
0647 Monk-Okehampton, Devon (All Saints) 1 (of 4)
0648 Monk-Okehampton, Devon (All Saints) 2 (of 4)
0649 Monk-Okehampton, Devon (All Saints) 3 (of 4)
0650 Monkton, Devon (St Mary Magdalene) 1 (of 3)
0651 Monkton, Devon (St Mary Magdalene) 2 (of 3)
0652 Monkton, Devon (St Mary Magdalene) 3 (of 3)
0653 Moreleigh, Devon (All Saints) 1 (of 3)
0654 Moreleigh, Devon (All Saints) 2 (of 3)
0655 Moreleigh, Devon (All Saints) 3 (of 3)
0656 Mortehoe, Devon (St Mary) 1 (of 3)
0657 Mortehoe, Devon (St Mary) 2 (of 3)
0658 Newton St Petrock, Devon (St Petrock) 2 (of 3)
0659 Newton St Petrock, Devon (St Petrock) 3 (of 3)
0660 Newton Tracey, Devon (St Thomas of Canterbury) 1 (of 3)
0661 Newton Tracey, Devon (St Thomas of Canterbury) 2 (of 3)
0662 Newton Tracey, Devon (St Thomas of Canterbury) 3 (of 3)
0663 Northleigh, Devon (St Giles) 1 (of 4)
0664 Northleigh, Devon (St Giles) 2 (of 4)
0665 Northleigh, Devon (St Giles) 3 (of 4)
0666 Northleigh, Devon (St Giles) 4 (of 4)
0667 Offwell, Devon (St Mary) 1 (of 5)
0668 Offwell, Devon (St Mary) 4 (of 5)
0669 Okehampton, Devon (St James) 1 (of 1)
0670 Pancraswyke, Devon (St Pancras) 3 (of 5)
0671 Payhembury, Devon (St Mary) 3 (of 6)
0672 Payhembury, Devon (St Mary) 4 (of 6)
0673 Payhembury, Devon (St Mary) 5 (of 6)
0674 Peter's Marland, Devon (St Peter) 4 (of 4)
0675 Peter's Marland, Devon (St Peter) 3 (of 4)
0676 Pinhoe, Devon (St Michael) 1 (of 4)
0677 Plymtree, Devon (St John the Baptist) 3 (of 5)
0678 Puddington, Devon (St Thomas the Apostle) 3 (of 3)
0679 Revelstoke, Devon (St Peter) 1 (of 2)
0680 Ringmore, Devon (All Hallows) 1 (of 3)
0681 Romansleigh, Devon (St Rumon) 2 (of 3)
0682 Salcombe Regis, Devon (St Peter) 1 (of 3)
0683 Seaton, Devon (St George) 2 (of 4)
0684 Seaton, Devon (St George) 4 (of 4)
0685 Sheepwash, Devon (St Lawrence) ? (of 3)
0686 Sheldon, Devon (St James) 1 (of 3)
0687 Sheldon, Devon (St James) 2 (of 3)
0688 Sidmouth, Devon (SS Giles & Nicholas) 4 (of 6)
0689 South Huish, Devon (St Andrew) 3 (of 4)
0690 Southleigh, Devon (St Lawrence) 1 (of 4)
0691 Sowton, Devon (St Michael) 1 (of 3)
0692 Stockleigh English, Devon (St Mary) 1 (of 4)
0693 Stockleigh English, Devon (St Mary) 2 (of 4)
0694 Stockleigh Pomeroy, Devon (St Mary) 1 (of 3)
0695 Stockleigh Pomeroy, Devon (St Mary) 2 (of 3)
0696 Stockleigh Pomeroy, Devon (St Mary) 3 (of 3)
0697 Talaton, Devon (St James) 3 (of 5)
0698 Talaton, Devon (St James) 5 (of 5)

0699 Templeton, Devon (St Margaret) 1 (of 3)
0700 Thornbury, Devon (St Peter) 3 (of 3)
0701 Tor Bryan, Devon (The Holy Trinity) 1 (of 4)
0702 Tor Bryan, Devon (The Holy Trinity) 2 (of 4)
0703 Tor Bryan, Devon (The Holy Trinity) 3 (of 4)
0704 Tor Bryan, Devon (The Holy Trinity) 4 (of 4)
0705 Tor Mohun, Devon (St Saviour) 1 (of 3)
0706 Townstall, Devon (St Mary Magdalene) 1 (of 4)
0707 Townstall, Devon (St Mary Magdalene) 2 (of 4)
0708 Townstall, Devon (St Mary Magdalene) 3 (of 4)
0709 Trusham, Devon (All Saints) 3 (of 4)
0710 Twitchen, Devon (St Peter) 2 (of 3)
0711 Uplowman, Devon (St Peter) 4 (of 5)
0712 Upton Hellions, Devon (St Mary) ? (of 3)
0713 Warkleigh, Devon (St John) 2 (of 3)
0714 Warkleigh, Devon (St John) 3 (of 3)
0715 Wembworthy, Devon (St Michael) 1 (of 3)
0716 Wembworthy, Devon (St Michael) 2 (of 3)
0717 Wembworthy, Devon (St Michael) 3 (of 3)
0718 West Anstey, Devon (St Petrock) 3 (of 4)
0719 Westleigh, Devon (SS Peter & Petrock) 2 (of 4)
0720 Westleigh, Devon (SS Peter & Petrock) 4 (of 4)
0724 West Teignmouth, Devon (St James) 1 (of 4)
0725 West Teignmouth, Devon (St James) 2 (of 4)
0726 West Teignmouth, Devon (St James) 3 (of 4)
0727 West Worlington, Devon (St Mary) 4 (of 6)
0728 West Worlington, Devon (St Mary) 5 (of 6)
0729 Whimple, Devon (St Mary) 1 (of 4)
0730 Whimple, Devon (St Mary) 2 (of 4)
0731 Whimple, Devon (St Mary) 3 (of 4)
0732 Whitestone, Devon (St Katherine) 2 (of 4)
0733 Whitestone, Devon (St Katherine) 3 (of 4)
0734 Whitestone, Devon (St Katherine) 4 (of 4)
0735 Woodbury, Devon (St Swithin) 4 (of 6)
0736 Woodland, Devon (St John the Baptist) 1 (of 3)
0737 Woodleigh, Devon (St Mary) 3 (of 3)
0738 Woolborough, Devon (St Mary) 2 (of 4)
0739 Woolborough, Devon (St Mary) 3 (of 4)
0740 Woolborough, Devon (St Mary) 4 (of 4)
0741 Woolfardisworthy, Devon (The Holy Trinity) 3 (of 3)
0742 Yarnscombe, Devon (St Andrew) 4 (of 4)
0743 Almer, Dorset (St Mary) 2 (of 4)
0744 Almer, Dorset (St Mary) 3 (of 4)
0745 Almer, Dorset (St Mary) 4 (of 4)
0746 Alton Pancras, Dorset (St Pancras) 2 (of 4)
0747 Alton Pancras, Dorset (St Pancras) 3 (of 4)
0748 Batcombe, Dorset (St Mary Magdalene) 1 (of 3)
0749 Beer Hackett, Dorset (St Michael) 2 (of 3)
0750 Blandford, Dorset (St Mary) 2 (of 3)
0751 Blandford, Dorset (St Mary) 3 (of 3)
0752 Bloxworth, Dorset (St Andrew) 1 (of 2)
0753 Broadwindsor, Dorset (St John the Baptist) 3 (of 6)
0754 Broadwindsor, Dorset (St John the Baptist) 4 (of 6)
0755 Broadwindsor, Dorset (St John the Baptist) 5 (of 6)
0756 Buckham Weston, Dorset (St John the Baptist) 5 (of 6)
0757 Buckland Newton, Dorset (The Holy Rood) 2 (of 5)
0758 Burstock, Dorset (St Andrew) 2 (of 2)
0759 Cattistock, Dorset (SS Peter & Paul) 3 (of 3)
0760 Caundle Stourton, Dorset (St Peter) 2 (of 4)
0761 Chaldon Herring, Dorset (St Nicholas) 3 (of 3)
0762 Chardstock, Dorset (St Andrew) 1 (of 5)
0763 Chardstock, Dorset (St Andrew) 2 (of 5)
0764 Charlton Marshall, Dorset (St Mary) 2 (of 4)
0765 Charlton Marshall, Dorset (St Mary) 3 (of 4)
0766 Charlton Marshall, Dorset (St Mary) 4 (of 4)
0767 Cheselbourne, Dorset (St Martin) 2 (of 5)
0768 Cheselbourne, Dorset (St Martin) 3 (of 5)
0769 Chetnole, Dorset (St Peter) 1 (of 3)
0770 Chetnole, Dorset (St Peter) 2 (of 3)
0771 Chettle, Dorset (St Mary) 1 (of 3)
0772 Chettle, Dorset (St Mary) 2 (of 3)
0773 Chettle, Dorset (St Mary) 3 (of 3)
0774 Chideock, Dorset (St Giles) 2 (of 5)
0775 Coombe Keynes, Dorset (The Holy Rood) 1 (of 3)
0776 Compton Abbas, Dorset (St Mary) 4 (of 5)
0777 Compton Over, Dorset (St Michael) 3 (of 4)
0778 Cranborne, Dorset (SS Bartholomew & Mary) 5 (of 8)
0779 Durweston, Dorset (St Nicholas) 2 (of 5)
0780 East Lulworth, Dorset (St Andrew) 2 (of 3)
0781 East Morden, Dorset (St Mary) 3 (of 5)
0782 East Morden, Dorset (St Mary) 4 (of 5)
0783 Farnham, Dorset (St Lawrence) 1 (of 2)
0784 Farrington, Dorset (St Peter) 1 (of 1)
0785 Fifehead Magdalen, Dorset (St Mary Magdalene) 3 (of 3)
0786 Fifehead Neville, Dorset (All Saints) 3 (of 3)
0787 Folke, Dorset (St Lawrence) 2 (of 5)
0788 Fontmell Magna, Dorset (St Andrew) 5 (of 6)
0789 Fontmell Magna, Dorset (St Andrew) 6 (of 6)
0790 Fordington, Dorset (St George) 3 (of 6)
0791 Fordington, Dorset (St George) 5 (of 6)
0792 Frome St Quentin, Dorset (St Mary) 2 (of 2)

0793 Gillingham, Dorset (St Mary) Priest's bell (of 8)
0794 Godmanstone, Dorset (The Holy Trinity) 1 (of 3)
0795 Gussage All Saints, Dorset (All Saints) 2 (of 4)
0796 Gussage All Saints, Dorset (All Saints) 3 (of 4)
0797 Gussage All Saints, Dorset (All Saints) 4 (of 4)
0798 Hammoon, Dorset (St Paul) 1 (of 2)
0799 Hammoon, Dorset (St Paul) 2 (of 2)
0800 Hanford, Dorset (St Michael & All Angels) 1 (of 1)
0801 Haselbury Bryan, Dorset (SS Mary & James) 2 (of 5)
0802 Haselbury Bryan, Dorset (SS Mary & James) 3 (of 5)
0803 Haselbury Bryan, Dorset (SS Mary & James) 5 (of 5)
0804 Hilton, Dorset (All Saints) 1 (of 4)
0805 Iwerne Courtney (Shroton), Dorset (St Mary) 4 (of 4)
0806 Iwerne Minster, Dorset (St Mary) 3 (of 5)
0807 Kimmeridge, Dorset (unknown) 1 (of 1)
0808 Kington Magna, Dorset (St Lawrence) 4 (of 4)
0809 Langton Long Blandford, Dorset (All Saints) 2 (of 3)
0810 Langton Matravers, Dorset (St George) 3 (of 3)
0811 Lillington, Dorset (St Martin) 3 (of 4)
0812 Little Bredy, Dorset (St Michael & All Angels) 5 (of 6)
0813 Little Bredy, Dorset (St Michael & All Angels) 6 (of 6)
0814 Litton Cheney, Dorset (St Mary) 5 (of 6)
0815 Litton Cheney, Dorset (St Mary) 6 (of 6)
0816 Long Burton, Dorset (St James) 4 (of 4)
0817 Lytchet Maltravers, Dorset (St Mary) 1 (of 3)
0818 Lytchet Minster, Dorset (unknown) 3 (of 4)
0819 Maiden Newton, Dorset (St Mary) 5 (of 6)
0820 Manston, Dorset (St Nicholas) 2 (of 4)
0821 Mappowder, Dorset (SS Peter & Paul) ? (of ?)
0822 Marnhull, Dorset (St Gregory) 4 (of 5)
0823 Melbury Bubb, Dorset (St Mary) 2 (of 4)
0824 Melbury Sampford, Dorset (St Mary) 1 (of 1)
0825 Melcombe Bingham, Dorset (St Andrew) Disused (of 1)
0826 Melcombe Bingham, Dorset (St Andrew) 1 (of 1)
0827 Milbourne St Andrew, Dorset (St Andrew) 3 (of 3)
0828 Milton Abbas, Dorset (St James the Great) 1 (of 2)
0829 Minterne Magna, Dorset (St Andrew) 1 (of 2)
0830 Minterne Magna, Dorset (St Andrew) 2 (of 2)
0831 More Crichel, Dorset (St Mary) 1 (of 1)
0832 Nether Cerne, Dorset (All Saints) 2 (of 3)
0833 Nether Cerne, Dorset (All Saints) 3 (of 3)
0834 Nether Compton, Dorset (St Nicholas) 2 (of 5)
0835 North Wooton, Dorset (St Mary Magdalene) 1 (of 2)
0836 North Wooton, Dorset (St Mary Magdalene) 2 (of 2)
0837 Oborne, Dorset (St Cuthbert) 1 (of 1)
0838 Okeford Fitzpaine, Dorset (St Andrew) 2 (of 4)
0839 Osmington, Dorset (St Osmund) 1 (of 4)
0840 Osmington, Dorset (St Osmund) 2 (of 4)
0841 Owermoigne, Dorset (St Michael) 1 (of 3)
0842 Piddlehinton, Dorset (St Mary) 3 (of 5)
0843 Piddlehinton, Dorset (St Mary) 4 (of 5)
0844 Piddletrenthide, Dorset (All Saints) 4 (of 5)
0845 Pimperne, Dorset (St Peter) 3 (of 3)
0846 Poxwell, Dorset (St John) 1 (of 1)
0847 Pulham, Dorset (St Thomas of Canterbury) 2 (of 3)
0848 Rampisham, Dorset (St Michael & All Angels) 1 (of 5)
0849 Rampisham, Dorset (St Michael & All Angels) 3 (of 5)
0850 St Margaret Marsh, Dorset (St Margaret) 1 (of 2)
0851 Shaftesbury, Dorset (St James) 3 (of 6)
0852 Shapwick, Dorset (St Bartholomew) ? (of ?)
0853 Shapwick, Dorset (St Bartholomew) ? (of ?)
0854 Shapwick, Dorset (St Bartholomew) 1 (of ?)
0855 Sherbourne, Dorset (St Mary) Sanctus bell (of 8)
0856 Shipton George, Dorset (St Martin) 3 (of 3)
0857 Silton, Dorset (St Nicholas) 3 (of 5)
0858 Steeple, Dorset (St Michael) 1 (of 3)
0859 Stinsford, Dorset (St Michael) 1 (of 3)
0860 Stock Gaylard, Dorset (unknown) 1 (of 2)
0861 Stock Gaylard, Dorset (unknown) 2 (of 2)
0862 Stoke Abbot, Dorset (St Mary) 4 (of 5)
0863 Stourpaine, Dorset (The Holy Trinity) 5 (of 5)
0864 Stower Provost, Dorset (St Michael) 2 (of 4)
0865 Stower Provost, Dorset (St Michael) 3 (of 4)
0866 Sturminster Marshall, Dorset (St Mary) 1 (of 4)
0867 Sturminster Marshall, Dorset (St Mary) 3 (of 4)
0868 Sturminster Marshall, Dorset (St Mary) 4 (of 4)
0869 Swyre, Dorset (The Holy Trinity) 1 (of 2)
0870 Swyre, Dorset (The Holy Trinity) 2 (of 2)
0871 Sydling, Dorset (St Nicholas) 1 (of 5)
0872 Sydling, Dorset (St Nicholas) 2 (of 5)

0873 Tarrant Crawford, Dorset (St Mary) 1 (of 3)
0874 Tarrant Crawford, Dorset (St Mary) 3 (of 3)
0875 Tarrant Hinton, Dorset (St Mary) 1 (of 3)
0876 Tarrant Keynston, Dorset (All Saints) 1 (of 1)
0878 Tincleton, Dorset (St John the Evangelist) 2 (of 2)
0879 Tolpuddle, Dorset (St John) 1 (of 4)
0880 Tolpuddle, Dorset (St John) 3 (of 4)
0881 Tolpuddle, Dorset (St John) 4 (of 4)
0882 Toners Puddle, Dorset (The Holy Trinity) 1 (of 2)
0883 Turnworth, Dorset (St Mary) 2 (of 3)
0884 Tyneham, Dorset (St Mary) 1 (of 2)
0885 Wambrook, Dorset (St Mary) 1 (of 4)
0886 Wambrook, Dorset (St Mary) 2 (of 4)
0887 Wambrook, Dorset (St Mary) 3 (of 4)
0888 Wambrook, Dorset (St Mary) 4 (of 4)
0889 West Chelborough, Dorset (unknown) 1 (of 2)
0890 West Chelborough, Dorset (unknown) 2 (of 2)
0891 West Chickerell, Dorset (The Holy Trinity) 1 (of 2)
0892 West Milton, Dorset (St Mary Magdalene) 1 (of 1)
0893 West Orchard, Dorset (unknown) 1 (of 2)
0894 West Orchard, Dorset (unknown) 2 (of 2)
0895 West Stower, Dorset (St Mary) 3 (of 3)
0896 Whitechurch Canonicorum, Dorset (St Candida & Holy Cross) 5 (of 5)
0897 Wimborne, Dorset (St Cuthberga) 5 (of 5)
0898 Wimborne, Dorset (St Cuthberga) Sanctus bell (of 5)
0899 Wimborne, Dorset (St Margaret) 1 (of 1)
0900 Winterbourne Abbas, Dorset (St Mary) 3 (of 3)
0901 Winterbourne Anderson, Dorset (St Michael) 1 (of 2)
0902 Winterbourne Anderson, Dorset (St Michael) 2 (of 2)
0903 Winterbourne Came, Dorset (St Peter) 2 (of ?)
0904 Winterbourne Came, Dorset (St Peter) 3 (of ?)
0905 Winterbourne Houghton, Dorset (St Andrew) 2 (of 3)
0906 Winterbourne Monkton, Dorset (SS Simon & Jude) 1 (of 1)
0907 Winterbourne Steepleton, Dorset (St Michael) 1 (of 1)
0908 Winterbourne Whitchurch, Dorset (St Mary) 4 (of 5)
0909 Winterbourne Zelstone, Dorset (St Mary) 3 (of 4)
0910 Wooton Glanville, Dorset (St Mary) 4 (of 4)
0911 Wraxhall, Dorset (St Mary) 1 (of 1)
0912 Yetminster, Dorset (St Andrew) 3 (of 5)
0913 Bishop Middleham, Co Durham (St Michael) 2 (of 2)
0914 Boldon, Co Durham (St Nicholas) 2 (of 2)
0915 Castle Eden, Co Durham (St James) 1 (of 2)
0916 Chester-Le-Street, Co Durham (SS Mary & Cuthbert) 1 (of 3)
0917 Chester-Le-Street, Co Durham (SS Mary & Cuthbert) 2 (of 3)
0918 Church Kelloe, Co Durham (St Helen the Empress) 1 (of 2)
0919 Church Kelloe, Co Durham (St Helen the Empress) 2 (of 2)
0920 Cockfield, Co Durham (St Mary) 1 (of 2)
0921 Cockfield, Co Durham (St Mary) 2 (of 2)
0922 Coniscliffe, Co Durham (St Edwin) 1 (of 3)
0923 Dalton-Le-Dale, Co Durham (The Holy Trinity & St Andrew) 1 (of 2)
0924 Durham, Co Durham 1 (of 1)
0925 Durham, Co Durham (The castle gatehouse) 1 (of 8)
0926 Durham, Co Durham (St Giles) 1 (of 3)
0927 Durham, Co Durham (St Giles) 2 (of 3)
0928 Durham, Co Durham (St Margaret) 1 (of 3)
0929 Durham, Co Durham (St Margaret) 2 (of 3)
0930 Escomb, Co Durham (St John the Evangelist) 1 (of 1)
0931 Gainford, Co Durham (St Mary) 1 (of 3)
0932 Gainford, Co Durham (St Mary) 2 (of 3)
0934 Heighington, Co Durham (St Michael) 1 (of 6)
0935 Heighington, Co Durham (St Michael) 2 (of 6)
0936 Heighington, Co Durham (St Michael) 3 (of 6)
0937 Jarrow, Co Durham (St Paul) 1 (of 2)
0938 Middleton, Co Durham (St George) 1 (of 1)
0939 Monk Heselden, Co Durham (St Mary) 1 (of 2)
0940 Monk Heselden, Co Durham (St Mary) 2 (of 2)
0942 Pittington, Co Durham (St Lawrence) 1 (of 3)
0943 Pittington, Co Durham (St Lawrence) 2 (of 3)
0944 Pittington, Co Durham (St Lawrence) 3 (of 3)
0945 Sadberge, Co Durham (St Andrew) 2 (of 2)
0946 St Helen's Auckland, Co Durham (St Helen) 2 (of 2)
0947 Seaham, Co Durham (St Mary) 1 (of 2)
0948 Seaham, Co Durham (St Mary) 2 (of 2)
0949 Sedgefield, Co Durham (St Edmund) 5 (of 5)
0950 Stranton, Co Durham (All Saints) 2 (of 3)
0951 Whitburn, Co Durham (St Mary) 1 (of 2)
0952 Whitburn, Co Durham (St Mary) 2 (of 2)
0953 Wingate, Co Durham (The Holy Trinity) 1 (of 1)

0954 Abbess Roothing, Essex (St Edmund) 1 (of 3)
0955 Abbess Roothing, Essex (St Edmund) 2 (of 3)
0958 Alphamstone, Essex (unknown) 1 (of 3)
0959 Alphamstone, Essex (unknown) 2 (of 3)
0960 Alphamstone, Essex (unknown) 3 (of 3)
0961 Althorne, Essex (St Andrew) 1 (of 2)
0962 Ardleigh, Essex (St Mary) 8 (of 8)
0963 Ashdon, Essex (All Saints) 5 (of 6)
0964 Asheldham, Essex (St Lawrence) 1 (of 1)
0965 Ashen, Essex (St Augustine) 1 (of 3)
0966 Ashen, Essex (St Augustine) 2 (of 3)
0967 Ashen, Essex (St Augustine) 3 (of 3)
0968 Aveley, Essex (St Michael) 3 (of 5)
0969 Aythorpe Roothing, Essex (St Mary) 1 (of 3)
0970 Aythorpe Roothing, Essex (St Mary) 2 (of 3)
0971 Aythorpe Roothing, Essex (St Mary) 3 (of 3)
0972 Basildon, Essex (Holy Cross) 3 (of 3)
0973 Beaumont With Moze, Essex (St Leonard) 1 (of 2)
0974 Belchamp Otten, Essex (St Ethelbert & All Saints) 1 (of 3)
0975 Belchamp Otten, Essex (St Ethelbert & All Saints) 2 (of 3)
0976 Belchamp Walter, Essex (St Mary) 7 (of 8)
0977 Berechurch, Essex (St Michael) 1 (of 1)
0978 Billericay, Essex (St Mary Magdalene) 1 (of 1)
0979 Bocking, Essex (St Mary) Clockbell (of 8)
0980 Bowers Gifford, Essex (St Margaret) 1 (of 2)
0981 Bowers Gifford, Essex (St Margaret) 2 (of 2)
0982 Bradfield, Essex (St Lawrence) 1 (of 1)
0983 Braintree, Essex (St Michael) Clockbell (of 8)
0984 Brightlingsea, Essex (All Saints) 1 (of 1)
0985 Burnham, Essex (St Mary) 3 (of 5)
0986 Buttsbury, Essex (St Mary) 1 (of 1)
0987 Castle Hedingham, Essex (St Nicholas) 5 (of 5)
0988 Chickney, Essex (St Mary) 1 (of 2)
0989 Chickney, Essex (St Mary) 2 (of 2)
0990 Chignal Smealey, Essex (St Nicholas) 1 (of 1)
0991 Chrishall, Essex (The Holy Trinity) 4 (of 4)
0992 Colchester, Essex (St Leonard) 2 (of 5)
0993 Colchester, Essex (St Leonard) 3 (of 5)
0994 Colchester, Essex (SS Nicholas & Runwald) 3 (of 6)
0995 Colchester, Essex (SS Nicholas & Runwald) 6 (of 6)
0997 Copford, Essex (St Michael & All Angels) 1 (of 3)
0998 Copford, Essex (St Michael & All Angels) 2 (of 3)
0999 Cranham, Essex (All Saints) 1 (of 3)
1000 Cranham, Essex (All Saints) 2 (of 3)
1001 Cranham, Essex (All Saints) 3 (of 3)
1002 Debden, Essex (St Mary) Sanctus bell (of 1)
1003 Dedham, Essex (St Mary) 6 (of 8)
1004 Dengie, Essex (St James) 2 (of 2)
1005 Doddinghurst, Essex (All Saints) 1 (of 3)
1006 Dovercourt, Essex (All Saints) 2 (of 2)
1007 Dunton, Essex (St Mary) 1 (of 1)
1008 East Ham, Essex (St Mary Magdalene) ? (of 3)
1009 East Mersea, Essex (St Edmund) 1 (of 1)
1010 Eastwood, Essex (St Lawrence & All Saints) 2 (of 3)
1011 Eastwood, Essex (St Lawrence & All Saints) 3 (of 3)
1012 Elsenham, Essex (St Mary) 1 (of 4)
1013 Fairstead, Essex (St Mary) 3 (of 4)
1014 Faulkbourne, Essex (St Germain) 1 (of 2)
1015 Faulkbourne, Essex (St Germain) 2 (of 2)
1016 Finchingfield, Essex (St John the Baptist) Clockbell (of 1)
1017 Fingringhoe, Essex (St Andrew) 2 (of 3)
1018 Fingringhoe, Essex (St Andrew) 3 (of 3)
1019 Frating, Essex (unknown) 1 (of 3)
1020 Frating, Essex (unknown) 3 (of 3)
1021 Fyfield, Essex (St Nicholas) 3 (of 6)
1022 Gestingthorpe, Essex (St Mary) 6 (of 6)
1023 Good Easter, Essex (St Andrew) 3 (of 5)
1024 Gosfield, Essex (St Katherine) 3 (of 3)
1025 Grays Thurrock, Essex (SS Peter & Paul) 2 (of 2)
1026 Great Baddow, Essex (St Mary) Sanctus bell (of 8)
1027 Great Braxted, Essex (All Saints) 2 (of 3)
1028 Great Braxted, Essex (All Saints) 3 (of 3)
1029 Great Burstead, Essex (St Mary Magdalene) 4 (of 5)
1030 Great Canfield, Essex (St Mary) 2 (of 3)
1031 Great Chesterford, Essex (All Saints) Clockbell (of 6)
1032 Great Easton, Essex (St John) 4 (of 5)
1033 Great Easton, Essex (St John) 5 (of 5)
1034 Great Henny, Essex (St Mary) 1 (of 3)
1035 Great Holland, Essex (All Saints) 1 (of 2)
1036 Great Holland, Essex (All Saints) 2 (of 2)
1037 Great Horkesley, Essex (All Saints) 4 (of 6)
1038 Great Horkesley, Essex (All Saints) 6 (of 6)
1039 Great Maplestead, Essex (St Giles) 1 (of 3)
1040 Great Totham, Essex (St Peter) 1 (of 2)
1041 Great Totham, Essex (St Peter) 2 (of 2)
1042 Great Waltham, Essex (SS Mary & Lawrence) 4 (of 8)
1043 Great Waltham, Essex (SS Mary & Lawrence) 6 (of 8)
1044 Great Wigborough, Essex (St Stephen) 1 (of 2)
1045 Halstead, Essex (St Andrew) 6 (of 8)
1046 Hempstead, Essex (St Andrew) 3 (of 5)
1047 Henham, Essex (St Mary) 4 (of 5)
1048 Heybridge, Essex (St Andrew) 1 (of 2)

1049 High Easter, Essex (St Mary) 4 (of 6)
1050 High Laver, Essex (All Saints) Sanctus bell (of 1)
1052 Kelvendon Hatch, Essex (St Nicholas) 1 (of 1)
1053 Laindon Clays, Essex (St Nicholas) 3 (of 5)
1054 Laindon Clays, Essex (St Nicholas) 4 (of 5)
1055 Laindon Hills, Essex (St Mary & All Saints) 2 (of 2)
1056 Langford, Essex (St Giles) 3 (of 3)
1057 Layer Breton, Essex (St Mary) 1 (of 1)
1059 Layer Marney, Essex (St Mary) 1 (of 3)
1060 Layer Marney, Essex (St Mary) 2 (of 3)
1063 Lexden, Essex (St Leonard) Clockbell (of 11)
1067 Liston, Essex (unknown) 1 (of 2)
1068 Leyton, Essex (St Mary) 6 (of 6)
1069 Little Baddow, Essex (St Mary) 2 (of 4)
1070 Little Baddow, Essex (St Mary) 4 (of 4)
1071 Little Bardfield, Essex (St Katherine) 2 (of 2)
1072 Little Braxted, Essex (St Nicholas) 1 (of 2)
1073 Little Braxted, Essex (St Nicholas) 2 (of 2)
1074 Little Bromley, Essex (St Mary) 3 (of 4)
1075 Little Bromley, Essex (St Mary) 4 (of 4)
1076 Littlebury, Essex (The Holy Trinity) Clockbell (of 6)
1077 Little Chesterford, Essex (St Mary) ? (of 3)
1078 Little Clacton, Essex (St James) 2 (of 3)
1079 Little Easton, Essex (St Mary the Virgin) 1 (of 3)
1080 Little Easton, Essex (St Mary the Virgin) Priest's bell (of 3)
1081 Little Hallingbury, Essex (St Mary) 1 (of 3)
1082 Little Hallingbury, Essex (St Mary) 3 (of 3)
1083 Little Horkesley, Essex (SS Peter & Paul) 5 (of 5)
1084 Little Sampford, Essex (St Mary) 1 (of 1)
1085 Little Totham, Essex (All Saints) 1 (of 3)
1086 Little Totham, Essex (All Saints) 2 (of 3)
1087 Little Warley, Essex (St Peter) 1 (of 1)
1088 Magdalen Laver, Essex (St Mary Magdalene) 2 (of 2)
1089 Maldon, Essex (All Saints) Sanctus bell (of 6)
1090 Margaretting, Essex (St Margaret) 1 (of 4)
1091 Margaretting, Essex (St Margaret) 2 (of 4)
1092 Margaretting, Essex (St Margaret) 3 (of 4)
1093 Margaretting, Essex (St Margaret) 4 (of 4)
1094 Matching, Essex (St Mary) 1 (of 5)
1095 Matching, Essex (St Mary) 2 (of 5)
1096 Mount Bures, Essex (St John) 1 (of 2)
1097 Mount Bures, Essex (St John) 2 (of 2)
1098 Mountnessing, Essex (St Giles) 1 (of 1)
1099 Mundon, Essex (St Mary) 1 (of 1)
1100 Navestock, Essex (St Thomas the Apostle) 3 (of 5)
1101 Netteswell, Essex (St Andrew) 2 (of 3)
1102 Netteswell, Essex (St Andrew) 3 (of 3)
1103 Newport, Essex (St Mary) 3 (of 6)
1104 North Benfleet, Essex (All Saints) 1 (of 2)
1105 North Benfleet, Essex (All Saints) 2 (of 2)
1106 Pebmarsh, Essex (St John the Baptist) 5 (of 5)
1107 Pitsea, Essex (St Michael) 3 (of 3)
1108 Pleshey, Essex (The Holy Trinity) 2 (of 5)
1109 Pleshey, Essex (The Holy Trinity) 4 (of 5)
1110 Radwinter, Essex (St Mary) 6 (of 8)
1111 Rawreth, Essex (St Nicholas) 1 (of 2)
1112 Rawreth, Essex (St Nicholas) 2 (of 2)
1113 Rayleigh, Essex (The Holy Trinity) 5 (of 8)
1114 Rayleigh, Essex (The Holy Trinity) 6 (of 8)
1115 Ridgewell, Essex (St Lawrence) 3 (of 5)
1116 Ridgewell, Essex (St Lawrence) 5 (of 5)
1117 Romford, Essex (St Edward the Confessor) 8 (of 8)
1118 Runwell, Essex (St Mary) 4 (of 4)
1119 St Lawrence Newland, Essex (St Lawrence) 1 (of 1)
1120 Shalford, Essex (St Andrew) 5 (of 5)
1121 Sible Hedingham, Essex (St Peter) 2 (of 5)
1122 Sible Hedingham, Essex (St Peter) 3 (of 5)
1123 South Benfleet, Essex (St Mary) 3 (of 5)
1124 Southchurch, Essex (The Holy Trinity) 1 (of 1)
1125 Southminster, Essex (St Leonard) 2 (of 6)
1126 Stanstead Mountfichet, Essex (St Mary) 6 (of 8)
1127 Steeple, Essex (St Lawrence & All Saints) Disused (of 2)
1128 Stondon Massey, Essex (SS Peter & Paul) 2 (of 3)
1129 Strethall, Essex (St Mary the Virgin) 1 (of 2)
1130 Strethall, Essex (St Mary the Virgin) 2 (of 2)
1131 Sturmer, Essex (St Mary) 1 (of 3)
1132 Takeley, Essex (St Mary) 2 (of 4)
1133 Tendring, Essex (St Edmund) 3 (of 4)
1134 Tendring, Essex (St Edmund) ? (of 4)
1135 Theydon Bois, Essex (St Mary) 2 (of 3)
1136 Thorington, Essex (St Mary Magdalene) 5 (of 6)
1137 Thorpe-Le-Soken, Essex (St Mary) 1 (of 5)
1138 Tillingham, Essex (St Nicholas) 2 (of 6)
1139 Tillingham, Essex (St Nicholas) 3 (of 6)
1141 Tolleshunt Major, Essex (St Nicholas) 1 (of 3)
1142 Tolleshunt Major, Essex (St Nicholas) 2 (of 3)
1143 Twinstead, Essex (St John the Evangelist) 1 (of 1)
1144 Upminster, Essex (St Lawrence) 1 (of 3)
1145 Wakes Colne, Essex (All Saints) 2 (of 3)
1146 Weeley, Essex (St Andrew) 1 (of 2)
1147 Weeley, Essex (St Andrew) 2 (of 2)
1148 West Bergholt, Essex (Blessed Virgin Mary) 1 (of 1)
1150 Wicken Bonhunt, Essex (St Margaret) 1 (of 3)

1153 Wickham St Paul's, Essex (All Saints) 3 (of 5)
1154 Willingale Spain, Essex (All Saints) 2 (of 2)
1155 Wix, Essex (St Mary) 1 (of 1)
1156 Woodham Mortimer, Essex (St Margaret) 2 (of 3)
1157 Woodham Walter, Essex (St Michael) 2 (of 3)
1158 Wormingford, Essex (St Andrew) 3 (of 3)
1159 Willingale Spain, Essex (All Saints) 1 (of 2)
1160 Sadberge, Co Durham (St Andrew) Disused (of 2)
1161 Abenhall, Gloucestershire (St Michael) 1 (of 3)
1162 Abson, Gloucestershire (St James) 3 (of 6)
1163 Abson, Gloucestershire (St James) 5 (of 6)
1164 Abson, Gloucestershire (St James) 6 (of 6)
1165 Alderley, Gloucestershire (St Kenelm) 1 (of 1)
1166 Aldsworth, Gloucestershire (St Bartholomew) 1 (of 3)
1167 Aldsworth, Gloucestershire (St Bartholomew) 2 (of 3)
1168 Aldsworth, Gloucestershire (St Bartholomew) 3 (of 3)
1169 Aldsworth, Gloucestershire (St Bartholomew) Sanctus bell (of 3)
1170 Alveston, Gloucestershire (St Helen) 1 (of 3)
1171 Alveston, Gloucestershire (St Helen) 2 (of 3)
1172 Ampney Crucis, Gloucestershire (The Holy Rood) 5 (of 5)
1173 Boddington, Gloucestershire (St Mary Magdalene) 2 (of 3)
1174 Boddington, Gloucestershire (St Mary Magdalene) 3 (of 3)
1175 Bourton-on-the-Hill, Gloucestershire (St Mary) Sanctus bell (of 6)
1176 Brimpsfield, Gloucestershire (St Michael) 2 (of 3)
1177 Brimpsfield, Gloucestershire (St Michael) 3 (of 3)
1178 Bristol, Gloucestershire (St Peter) Sanctus bell (of 8)
1179 Bristol, Gloucestershire (St Stephen) Sanctus bell (of 8)
1180 Bristol, Gloucestershire (St Thomas) 5 (of 8)
1181 Bristol, Gloucestershire (St Thomas) 6 (of 8)
1182 Bristol, Gloucestershire (St Werbergh) 3 (of 6)
1183 Bristol, Gloucestershire (St Werbergh) 6 (of 6)
1184 Bristol, Gloucestershire (Temple) Sanctus bell (of 8)
1189 Brookthorpe, Gloucestershire (St Swithin) 1 (of 2)
1190 Boxwell, Gloucestershire (St Mary) 1 (of 1)
1192 Castle Eaton, Gloucestershire (St Mary) Sanctus bell (of 6)
1193 Charfield, Gloucestershire (St James) 1 (of 2)
1194 Charlton Abbots, Gloucestershire (SS Mary & Martin) 1 (of 1)
1196 Coberley, Gloucestershire (St Giles) 1 (of 3)
1197 Coberley, Gloucestershire (St Giles) 3 (of 3)
1198 Compton Abdale, Gloucestershire (St Oswald) 4 (of 4)
1199 Condicote, Gloucestershire (St Nicholas) 1 (of 1)
1200 Cromhall, Gloucestershire (St Andrew) 4 (of 6)
1201 Dowdeswell, Gloucestershire (St Michael) 2 (of 3)
1202 Driffield, Gloucestershire (St Mary) 1 (of 3)
1203 Driffield, Gloucestershire (St Mary) 2 (of 3)
1204 Driffield, Gloucestershire (St Mary) Sanctus bell (of 3)
1205 Duntisbourne Rous, Gloucestershire (St Michael & All Angels) 1 (of 2)
1206 Duntisbourne Rous, Gloucestershire (St Michael & All Angels) 2 (of 2)
1207 Dyrham, Gloucestershire (St Peter) 5 (of 6)
1208 Eastleach Martin, Gloucestershire (St Martin) 2 (of 3)
1209 Eastleach Martin, Gloucestershire (St Martin) 3 (of 3)
1211 Elmstone Hardwicke, Gloucestershire (St Mary Magdalene) 2 (of 4)
1212 Farmington, Gloucestershire (St Peter) 3 (of 3)
1213 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) 5 (of 8)
1214 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) 6 (of 8)
1215 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) Bourdon (of 8)
1216 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) 2 (of 8)
1217 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) 4 (of 8)
1218 Gloucester, Gloucestershire (St Peter & The Holy & Indivisible Trinity) 7 (of 8)
1219 Gloucester, Gloucestershire (St Nicholas) Sanctus bell (of 6)
1220 Gloucester, Gloucestershire (St Nicholas) 4 (of 6)
1221 Gloucester, Gloucestershire (St Nicholas) 5 (of 6)
1222 Gretton, Gloucestershire (Christchurch) 1 (of 1)
1223 Hailes, Gloucestershire (unknown) 1 (of 1)
1225 Hardwicke, Gloucestershire (SS Nicholas & John the Baptist) 3 (of 6)
1226 Harescombe, Gloucestershire (St John the Baptist) 1 (of 2)
1227 Harescombe, Gloucestershire (St John the Baptist) 2 (of 2)

1228 Harnhill, Gloucestershire (St Michael & All Angels) 1 (of 2)
1229 Hartpury, Gloucestershire (St Mary) 3 (of 5)
1230 Hawkesbury, Gloucestershire (St Mary) 1 (of 1)
1231 Hawling, Gloucestershire (St Edward) 1 (of 3)
1232 Hawling, Gloucestershire (St Edward) 2 (of 3)
1233 Hawling, Gloucestershire (St Edward) Sanctus bell (of 3)
1234 Hewelsfield, Gloucestershire (St Mary Magdalene) 5 (of 5)
1235 Hill, Gloucestershire (St Michael) 1 (of 1)
1236 Horton, Gloucestershire (St James the Elder) 2 (of ?)
1237 Horton, Gloucestershire (St James the Elder) 3 (of ?)
1238 Horton, Gloucestershire (St James the Elder) ? (of ?)
1239 Huntley, Gloucestershire (St John the Baptist) 5 (of 6)
1240 Icomb, Gloucestershire (St Mary the Virgin) 1 (of 3)
1241 Icomb, Gloucestershire (St Mary the Virgin) Sanctus bell (of 3)
1242 Kemble, Gloucestershire (All Saints) 4 (of 6)
1243 Kempley, Gloucestershire (St Mary) 2 (of 3)
1244 Kempley, Gloucestershire (St Mary) 3 (of 3)
1245 Lancaut, Gloucestershire (St James) 1 (of 1)
1246 Lasborough, Gloucestershire (St Mary) 1 (of 2)
1247 Leigh, Gloucestershire (St James) 1 (of 5)
1248 Leighterton, Gloucestershire (SS Andrew & James) 1 (of 1)
1249 Leonard Stanley, Gloucestershire (St Swithin) 1 (of 4)
1250 Leonard Stanley, Gloucestershire (St Swithin) 2 (of 4)
1251 Lower Slaughter, Gloucestershire (St Mary) 5 (of 6)
1252 Matson, Gloucestershire (St Katherine) 2 (of 2)
1253 Mayhill, Gloucestershire (All Saints) 1 (of 1)
1254 Minchinhampton, Gloucestershire (The Holy Trinity) Sanctus bell (of 6)
1255 Newland, Gloucestershire (All Saints) Sanctus bell (of 6)
1256 Notgrove, Gloucestershire (St Bartholomew) 2 (of 3)
1257 Oldbury On The Hill, Gloucestershire (St Arild) 2 (of 2)
1258 Oldbury On The Hill, Gloucestershire (St Arild) 1 (of 2)
1261 Oxenhall, Gloucestershire (St Anne) 1 (of 3)
1262 Oxenhall, Gloucestershire (St Anne) 2 (of 3)
1263 Pauntley, Gloucestershire (St John the Evangelist) 1 (of 3)
1264 Pauntley, Gloucestershire (St John the Evangelist) 2 (of 3)
1265 Pitchcombe, Gloucestershire (St John) 1 (of 1)
1266 Preston (near Ledbury), Gloucestershire (St John the Baptist) 1 (of 2)
1267 Randwick, Gloucestershire (St John the Baptist) 1 (of 4)
1268 Randwick, Gloucestershire (St John the Baptist) 2 (of 4)
1269 Rendcomb, Gloucestershire (St Peter) 4 (of 6)
1270 Rendcomb, Gloucestershire (St Peter) 5 (of 6)
1271 Rendcomb, Gloucestershire (St Peter) 6 (of 6)
1272 Sapperton, Gloucestershire (St Kenelm) 1 (of 3)
1273 Sapperton, Gloucestershire (St Kenelm) 2 (of 3)
1274 Saul, Gloucestershire (St James) 1 (of 1)
1275 Sevenhampton, Gloucestershire (St Andrew) 2 (of 3)
1276 Sherborne, Gloucestershire (St Mary Magdalene) 4 (of 6)
1277 Shipton Moyne, Gloucestershire (St John the Baptist) 6 (of 6)
1278 Shipton Oliffe, Gloucestershire (St Oswald) 2 (of 2)
1279 Siddington, Gloucestershire (St Peter) 1 (of 2)
1280 Siddington, Gloucestershire (St Peter) 2 (of 2)
1281 Snowshill, Gloucestershire (St Barbara) 1 (of 1)
1282 Southam, Gloucestershire (The Ascension) 1 (of 1)
1283 Standish, Gloucestershire (St Nicholas) 6 (of 6)
1284 Staunton (Coleford), Gloucestershire (All Saints) 3 (of 4)
1285 Staunton (Coleford), Gloucestershire (All Saints) 4 (of 4)
1286 Staverton, Gloucestershire (St John the Baptist) 1 (of 3)
1287 Stoke Giffard, Gloucestershire (St Michael) 1 (of 3)
1288 Stoke Giffard, Gloucestershire (St Michael) 2 (of 3)
1289 Stoke Orchard, Gloucestershire (St James the Great) 1 (of 1)
1291 Swindon, Gloucestershire (St Lawrence) 3 (of 4)
1292 Syde, Gloucestershire (St Mary the Virgin) 2 (of 3)
1293 Syde, Gloucestershire (St Mary the Virgin) 3 (of 3)

1294 Tibberton, Gloucestershire (The Holy Trinity) 1 (of 3)
1295 Tortworth, Gloucestershire (St Leonard) 5 (of 6)
1296 Turkdean, Gloucestershire (All Saints) 2 (of 3)
1297 Upper Slaughter, Gloucestershire (St Peter) 1 (of 3)
1298 Upper Slaughter, Gloucestershire (St Peter) 3 (of 3)
1299 Upper Slaughter, Gloucestershire (St Peter) 2 (of 3)
1300 Wapley, Gloucestershire (St Peter) 3 (of 5)
1301 Wapley, Gloucestershire (St Peter) 4 (of 5)
1302 Westcote, Gloucestershire (St Mary the Virgin) Sanctus bell (of 3)
1305 Weston On Avon, Gloucestershire (All Saints) 1 (of 1)
1306 Winstone, Gloucestershire (St Bartholomew) 1 (of 3)
1307 Winstone, Gloucestershire (St Bartholomew) 3 (of 3)
1309 Woodchester, Gloucestershire (St Mary the Virgin) 5 (of 6)
1310 Woolaston, Gloucestershire (St Andrew) 2 (of 5)
1311 Yate, Gloucestershire (St Mary) 2 (of 6)
1312 Yate, Gloucestershire (St Mary) 3 (of 6)
1313 Yate, Gloucestershire (St Mary) 4 (of 6)
1314 Aldershot, Hampshire (St Michael the Archangel) 3 (of 3)
1315 Appleshaw, Hampshire (St Peter) 1 (of 1)
1316 Arreton, Hampshire (Isle of Wight)(St George) Sanctus bell (of 5)
1317 Ashley, Hampshire (St Peter) 1 (of 2)
1318 Ashley, Hampshire (St Peter) 2 (of 2)
1319 Basingstoke, Hampshire (St Michael) 6 (of 8)
1320 Bighton, Hampshire (All Saints) 1 (of 1)
1321 Binstead, Hampshire (Isle of Wight)(Holy Cross) 1 (of 1)
1322 Bishop's Sutton, Hampshire (The Holy Trinity) 1 (of 3)
1323 Bonchurch, Hampshire (Isle of Wight)(St Boniface) 1 (of 1)
1324 Botley, Hampshire (All Saints) 1 (of 3)
1325 Botley, Hampshire (All Saints) 2 (of 3)
1326 Botley, Hampshire (All Saints) 3 (of 3)
1327 Bramshaw, Hampshire (St Peter) 1 (of 2)
1328 Bullington, Hampshire (St Michael & All Angels) 3 (of 3)
1329 Chale, Hampshire (Isle of Wight)(St Andrew) 2 (of 5)
1330 Chalton, Hampshire (St Michael) 2 (of 3)
1331 Chalton, Hampshire (St Michael) 3 (of 3)
1332 Chawton, Hampshire (St Nicholas) 3 (of 6)
1333 Chilcombe, Hampshire (St Andrew) 2 (of 2)
1334 Chilworth, Hampshire (St Denis) 1 (of 2)
1335 Chilworth, Hampshire (St Denis) 2 (of 2)
1336 Christchurch, Hampshire (The Holy Trinity) 5 (of 6)
1337 Christchurch, Hampshire (The Holy Trinity) 6 (of 6)
1338 Clanfield, Hampshire (St James) 1 (of 2)
1339 Clanfield, Hampshire (St James) 2 (of 2)
1340 Colmer, Hampshire (St Peter Ad Vincula) 1 (of 2)
1341 Combe, Hampshire (St Swithin) 1 (of 3)
1342 Compton, Hampshire (All Saints) 1 (of 3)
1343 Compton, Hampshire (All Saints) 3 (of 3)
1344 Dogmersfield, Hampshire (All Saints) 3 (of 3)
1345 East & West Wellow, Hampshire (St Margaret) 3 (of 3)
1346 East Dean, Hampshire (unknown) 1 (of 1)
1347 Easton, Hampshire (St Mary) 1 (of 3)
1348 Easton, Hampshire (St Mary) 2 (of 3)
1349 Exbury, Hampshire (St Katherine) 1 (of 1)
1350 Exton, Hampshire (SS Peter & Paul) 2 (of 2)
1351 Faccombe, Hampshire (St Barnabas) 2 (of 3)
1352 Farley Chamberlayne, Hampshire (St John) 1 (of 3)
1353 Farley Chamberlayne, Hampshire (St John) 2 (of 3)
1355 Gatcombe, Hampshire (Isle of Wight)(St Olave) 1 (of 3)
1356 Greywell, Hampshire (St Mary the Virgin) 1 (of 3)
1357 Hamble, Hampshire (St Andrew) 3 (of 3)
1358 Hartley Wespall, Hampshire (St Mary) 1 (of 3)
1359 Hartley Wespall, Hampshire (St Mary) 2 (of 3)
1360 Hawkley, Hampshire (SS Peter & Paul) 3 (of 6)
1361 Hawkley, Hampshire (SS Peter & Paul) 4 (of 6)
1362 Headbourne Worthy, Hampshire (St Swithin) 1 (of 3)
1363 Headbourne Worthy, Hampshire (St Swithin) 2 (of 3)
1364 Headbourne Worthy, Hampshire (St Swithin) 3 (of 3)
1365 Heckfield, Hampshire (St Michael) 3 (of 5)
1366 Heckfield, Hampshire (St Michael) 4 (of 5)
1367 Herriard, Hampshire (St Mary) 2 (of 3)
1368 Holdenhurst, Hampshire (St John the Evangelist) 2 (of 2)
1369 Holybourne, Hampshire (The Holy Rood) 1 (of 3)
1370 Idesworth, Hampshire (St Hubert) 1 (of 1)
1371 Itchen Abbas, Hampshire (St John the Baptist) 2 (of 3)
1372 King's Somborne, Hampshire (SS Peter & Paul) 4 (of 5)
1373 King's Worthy, Hampshire (St Mary) 1 (of 3)

1374 King's Worthy, Hampshire (St Mary) 2 (of 3)
1375 Long Sutton, Hampshire (All Saints) 1 (of 3)
1376 Long Sutton, Hampshire (All Saints) 2 (of 3)
1377 Long Sutton, Hampshire (All Saints) 3 (of 3)
1378 Mapledurwell, Hampshire (St Mary) 1 (of 3)
1379 Martyr Worthy, Hampshire (St Swithin) 1 (of 3)
1380 Mattingley, Hampshire (unknown) 1 (of 2)
1381 Mattingley, Hampshire (unknown) 2 (of 2)
1382 Milton, Hampshire (St Mary Magdalene) 2 (of 2)
1383 Minstead, Hampshire (All Saints) 2 (of 3)
1384 Mottistone, Hampshire (Isle of Wight)(SS Peter & Paul) 1 (of 1)
1385 Newnham, Hampshire (St Nicholas) 1 (of 3)
1386 Newton Valence, Hampshire (St Mary) 1 (of 5)
1387 North Baddesley, Hampshire (St John) 1 (of 2)
1388 North Hayling, Hampshire (St Peter) 1 (of 3)
1389 North Hayling, Hampshire (St Peter) 2 (of 3)
1390 North Hayling, Hampshire (St Peter) 3 (of 3)
1391 North Stoneham, Hampshire (St Nicholas) 3 (of 3)
1392 Over Wallop, Hampshire (St Peter) 5 (of 5)
1393 Paulsgrove, Hampshire (St Michael & All Angels) 1 (of 1)
1394 Penton Mewsey, Hampshire (The Holy Trinity) 1 (of 2)
1395 Penton Mewsey, Hampshire (The Holy Trinity) 2 (of 2)
1396 Quarley, Hampshire (St Michael & All Angels) 1 (of 3)
1397 Quarley, Hampshire (St Michael & All Angels) 2 (of 3)
1398 Rotherwick, Hampshire (unknown) 3 (of 6)
1399 Rotherwick, Hampshire (unknown) 5 (of 6)
1400 Sherborne St John, Hampshire (St Andrew) 3 (of 5)
1401 Sherfield-on-Lodden, Hampshire (St Leonard) 2 (of 4)
1402 Sherfield-on-Lodden, Hampshire (St Leonard) 3 (of 4)
1403 Shipton Bellinger, Hampshire (St Peter) 1 (of 3)
1404 Shipton Bellinger, Hampshire (St Peter) 2 (of 3)
1405 Soberton, Hampshire (St Peter) 6 (of 8)
1406 Soberton, Hampshire (St Peter) 7 (of 8)
1407 Southampton, Hampshire (The Ascension) 5 (of 8)
1408 Southampton, Hampshire (The Ascension) 7 (of 8)
1409 South Stoneham, Hampshire (St Mary) 1 (of 3)
1410 Southwick, Hampshire (St James) 2 (of 4)
1411 Steventon, Hampshire (St Nicholas) 1 (of 3)
1412 Steventon, Hampshire (St Nicholas) 3 (of 3)
1413 Stoke Charity, Hampshire (SS Mary & Michael) 2 (of 3)
1414 Stoke Charity, Hampshire (SS Mary & Michael) 3 (of 3)
1415 Tangley, Hampshire (St Thomas of Canterbury) Disused (of ?)
1416 Thorley, Hampshire (Isle of Wight)(St Swithin) 1 (of 2)
1417 Thorley, Hampshire (Isle of Wight)(St Swithin) 2 (of 2)
1418 Titchfield, Hampshire (St Peter) 5 (of 6)
1419 Upton Grey, Hampshire (St Mary) 2 (of 4)
1420 Upton Grey, Hampshire (St Mary) 4 (of 4)
1421 Warblington, Hampshire (St Thomas of Canterbury) 1 (of 1)
1422 Weeke, Hampshire (St Barnabas) 1 (of 1)
1423 Weeke, Hampshire (St Mary) 1 (of 3)
1424 West Tisted, Hampshire (St Mary) 2 (of 2)
1425 West Tytherley, Hampshire (unknown) 1 (of 3)
1426 West Tytherley, Hampshire (unknown) 2 (of 3)
1427 West Worldham, Hampshire (St Nicholas) 1 (of 1)
1428 Weyhill, Hampshire (St Michael & All Angels) 1 (of 4)
1429 Weyhill, Hampshire (St Michael & All Angels) 2 (of 4)
1430 Whitchurch, Hampshire (All Hallows) 2 (of 6)
1431 Whitchurch, Hampshire (All Hallows) 4 (of 6)
1432 Whitwell, Hampshire (Isle of Wight)(SS Mary & Radegund) 6 (of 6)
1433 Wield, Hampshire (St James) 1 (of 1)
1435 Winchester (Hyde), Hampshire (St Bartholomew) 1 (of 3)
1436 Winchester (Hyde), Hampshire (St Bartholomew) 2 (of 3)
1437 Winchester, Hampshire (St John the Baptist) 2 (of 5)
1438 Winchester, Hampshire (St John the Baptist) Sanctus bell (of 5)
1439 Winchfield, Hampshire (St Mary) 2 (of 3)
1440 Winchfield, Hampshire (St Mary) 3 (of 3)
1441 Winchester, Hampshire (St Maurice) 2 (of 5)
1442 Winchester, Hampshire (St Maurice) 4 (of 5)
1443 Winchester, Hampshire (St Michael) ? (of ?)
1444 Winchester, Hampshire (St Michael) 3 (of ?)
1445 Winchester, Hampshire (St Peter) 2 (of 3)
1446 Winchester, Hampshire (St Peter) 3 (of 3)
1447 Winchester, Hampshire (St Swithin) 2 (of 2)
1448 Yateley, Hampshire (St Peter) 3 (of 6)
1449 Aconbury, Herefordshire (St John the Baptist) 1 (of 1)
1450 Acton Beauchamp, Herefordshire (St Giles) 1 (of 3)
1451 Acton Beauchamp, Herefordshire (St Giles) 2 (of 3)

1452 Ashperton, Herefordshire (St Bartholomew) 3 (of 4)
1453 Ashperton, Herefordshire (St Bartholomew) 4 (of 4)
1454 Aston Ingham, Herefordshire (St John the Baptist) 4 (of 6)
1455 Aston Ingham, Herefordshire (St John the Baptist) 6 (of 6)
1456 Avenbury, Herefordshire (St Mary) 3 (of 3)
1457 Aylton, Herefordshire (unknown) 1 (of 2)
1458 Ballingham, Herefordshire (St Dubricus) 2 (of 3)
1459 Birley, Herefordshire (St Peter) 2 (of 3)
1460 Bollingham, Herefordshire (St Silas) 1 (of 1)
1461 Bridge Sollers, Herefordshire (St Andrew) 1 (of 2)
1462 Bridstow, Herefordshire (St Bridget) ? (of ?)
1463 Brimfield, Herefordshire (St Michael) 1 (of 3)
1464 Brimfield, Herefordshire (St Michael) 2 (of 3)
1465 Brinsop, Herefordshire (St George) 1 (of 3)
1466 Brinsop, Herefordshire (St George) 2 (of 3)
1467 Brinsop, Herefordshire (St George) 3 (of 3)
1468 Breinton, Herefordshire (St Michael) 1 (of 2)
1469 Breinton, Herefordshire (St Michael) 2 (of 2)
1470 Brobury, Herefordshire (St Mary Magdalene) 1 (of 1)
1471 Brockhampton by Ross, Herefordshire (The Holy Trinity) ? (of 2)
1472 Brockhampton by Ross, Herefordshire (The Holy Trinity) ? (of 2)
1474 Burrington, Herefordshire (St George) 1 (of 3)
1475 Byford, Herefordshire (St John the Baptist) 2 (of 3)
1476 Canon Frome, Herefordshire (St James) 1 (of 3)
1477 Canon Frome, Herefordshire (St James) 2 (of 3)
1478 Canon Pyon, Herefordshire (St Lawrence) Sanctus bell (of 5)
1479 Castle Frome, Herefordshire (St Michael) 1 (of 3)
1480 Coddington, Herefordshire (All Saints) Sanctus bell (of 6)
1481 Credenhill, Herefordshire (St Mary) 2 (of 3)
1482 Dewsall, Herefordshire (St Michael) 1 (of 3)
1483 Dewsall, Herefordshire (St Michael) 2 (of 3)
1484 Dewsall, Herefordshire (St Michael) 3 (of 3)
1485 Donnington, Herefordshire (St Mary) 1 (of 2)
1486 Dormington, Herefordshire (St Peter) 1 (of 3)
1487 Dorstone, Herefordshire (St Faith) 2 (of 4)
1488 Downton, Herefordshire (St Giles) Sanctus bell (of 3)
1489 Dulas, Herefordshire (St Michael) 1 (of 1)
1490 Edvin Loach, Herefordshire (St Mary) 2 (of 2)
1491 Elton, Herefordshire (St Mary) 1 (of 2)
1492 Elton, Herefordshire (St Mary) 2 (of 2)
1493 Fawley, Herefordshire (St John) 1 (of 1)
1494 Goodrich, Herefordshire (St Giles) 6 (of 6)
1495 Grendon Bishop, Herefordshire (St John the Baptist) 1 (of 2)
1496 Harewood, Herefordshire (St Denis) 1 (of 2)
1497 Hatfield, Herefordshire (St Leonard) 1 (of 2)
1498 Hatfield, Herefordshire (St Leonard) 2 (of 2)
1499 Hentland, Herefordshire (St Dubricus) 3 (of 4)
1500 Hereford, Herefordshire (All Saints) 1 (of 6)
1501 Hereford, Herefordshire (All Saints) 2 (of 6)
1502 Hereford, Herefordshire (All Saints) 3 (of 6)
1503 Hereford, Herefordshire (All Saints) 4 (of 6)
1504 Hereford, Herefordshire (All Saints) 5 (of 6)
1505 Hereford, Herefordshire (All Saints) 6 (of 6)
1506 Hereford, Herefordshire (The Blessed Virgin Mary & St Ethelbert) 5 (of 6)
1507 Hereford, Herefordshire (The Blessed Virgin Mary & St Ethelbert) 6 (of 6)
1508 Hereford, Herefordshire (The Blessed Virgin Mary & St Ethelbert) ? (of 6)
1509 Hereford, Herefordshire (The Blessed Virgin Mary & St Ethelbert) ? (of 6)
1510 Hereford, Herefordshire (St Nicholas) 2 (of 5)
1511 Hereford, Herefordshire (St Nicholas) 5 (of 5)
1512 Hereford, Herefordshire (St Peter) 1 (of 5)
1513 Holmer, Herefordshire (St Bartholomew) 4 (of 6)
1514 Humber, Herefordshire (St Mary) 1 (of 2)
1515 Kenchester, Herefordshire (St Michael) 2 (of 2)
1516 Kenderchurch, Herefordshire (St Mary) 1 (of 1)
1517 Kimbolton, Herefordshire (St James the Lesser) 5 (of 6)
1518 Kilpeck, Herefordshire (St David) 1 (of 1)
1520 Lea, Herefordshire (St John the Baptist) 2 (of 3)
1521 Lea, Herefordshire (St John the Baptist) 3 (of 3)
1522 Leinthall Starkes, Herefordshire (St Mary Magdalene) 1 (of 2)
1523 Leinthall Starkes, Herefordshire (St Mary Magdalene) 2 (of 2)
1524 Leominster, Herefordshire (SS Peter & Paul) Sanctus bell (of 10)
1525 Letton, Herefordshire (St John the Baptist) 1 (of 3)
1526 Letton, Herefordshire (St John the Baptist) 3 (of 3)
1527 Leysters, Herefordshire (St Andrew) 1 (of 3)
1528 Leysters, Herefordshire (St Andrew) 3 (of 3)

1529 Lingen, Herefordshire (St Michael & All Angels) 2 (of 3)
1530 Lingen, Herefordshire (St Michael & All Angels) 3 (of 3)
1531 Little Dewchurch, Herefordshire (St David) 4 (of 5)
1532 Llancillo, Herefordshire (St Peter) 1 (of 2)
1533 Llandinabo, Herefordshire (St Junabius (Dinebo)) 1 (of 2)
1534 Llanwarne, Herefordshire (St John) 1 (of 4)
1535 Lugwardine, Herefordshire (St Peter) 3 (of 5)
1536 Lugwardine, Herefordshire (St Peter) 4 (of 5)
1537 Marstow, Herefordshire (St Matthew) 2 (of 2)
1538 Michaelchurch, Herefordshire (St Michael) 1 (of 2)
1539 Middleton-on-the-Hill, Herefordshire (St Mary) 1 (of 3)
1540 Middleton-on-the-Hill, Herefordshire (St Mary) 2 (of 3)
1541 Middleton-on-the-Hill, Herefordshire (St Mary) 3 (of 3)
1542 Moccas, Herefordshire (St Michael) 1 (of 2)
1543 Moccas, Herefordshire (St Michael) 2 (of 2)
1544 Monnington-on-Wye, Herefordshire (St Mary) 3 (of 4)
1545 Ocle Pychard, Herefordshire (St James the Great) 3 (of 3)
1546 Ocle Pychard, Herefordshire (St James the Great) Sanctus bell (of 3)
1547 Pembridge, Herefordshire (St Mary) 5 (of 5)
1548 Pencoed, Herefordshire (St Denis) 1 (of 3)
1549 Pencoed, Herefordshire (St Denis) 2 (of 3)
1550 Pipe And Lyde, Herefordshire (St Peter) 3 (of 6)
1551 Pipe And Lyde, Herefordshire (St Peter) 5 (of 6)
1552 Preston-on-Wye, Herefordshire (St Lawrence) 1 (of 4)
1553 Pudleston, Herefordshire (St Peter) 1 (of 4)
1554 Pudleston, Herefordshire (St Peter) 3 (of 4)
1555 Putley, Herefordshire (unknown) 2 (of 3)
1556 Sarnesfield, Herefordshire (St Mary) 4 (of 4)
1557 Shobden, Herefordshire (St John the Evangelist) 1 (of 2)
1558 St Devereux, Herefordshire (St Dubricus) 2 (of 3)
1559 St Devereux, Herefordshire (St Dubricus) 3 (of 3)
1560 St Margarets, Herefordshire (St Margaret) 2 (of 2)
1561 Stoke Edith, Herefordshire (St Mary) 6 (of 6)
1562 Stoke Edith, Herefordshire (St Mary) 3 (of 6)
1563 Stoke Lacy, Herefordshire (SS Peter & Paul) 1 (of ?)
1564 Stoke Lacy, Herefordshire (SS Peter & Paul) 2 (of ?)
1565 Stoke Lacy, Herefordshire (SS Peter & Paul) ? (of ?)
1566 Stoke Prior, Herefordshire (St Luke) 3 (of 4)
1567 Stretton Sugwas, Herefordshire (St Mary Magdalene) 3 (of 4)
1568 Thornbury, Herefordshire (St Anne) 1 (of 3)
1569 Thornbury, Herefordshire (St Anne) 2 (of 3)
1570 Thornbury, Herefordshire (St Anne) 3 (of 3)
1571 Thruxton, Herefordshire (St Bartholomew) 1 (of 3)
1572 Turnastone, Herefordshire (St Mary Magdalene) 2 (of 2)
1573 Upper Sapey, Herefordshire (St Michael) 1 (of 1)
1574 Vowchurch, Herefordshire (St Bartholomew) ? (of 3)
1575 Walterstone, Herefordshire (St Mary) 1 (of 2)
1576 Wellington, Herefordshire (St Margaret) 2 (of 5)
1577 Wellington, Herefordshire (St Margaret) 4 (of 5)
1578 Wellington, Herefordshire (St Margaret) 5 (of 5)
1579 Welsh Bicknor, Herefordshire (St Margaret) 1 (of 2)
1580 Welsh Bicknor, Herefordshire (St Margaret) 2 (of 2)
1581 Weston-Under-Penyard, Herefordshire (St Lawrence) 1 (of 3)
1582 Weston-Under-Penyard, Herefordshire (St Lawrence) 2 (of 3)
1583 Weston-Under-Penyard, Herefordshire (St Lawrence) 3 (of 3)
1584 Weston-Under-Penyard, Herefordshire (St Lawrence) Sanctus bell (of 3)
1585 Whitbourne, Herefordshire (St John the Baptist) Sanctus bell (of 6)
1586 Whitchurch, Herefordshire (St Dubricus) 1 (of 2)
1587 Whitchurch, Herefordshire (St Dubricus) 2 (of 2)
1588 Woolhope, Herefordshire (St George) 4 (of 6)
1589 Wormesley, Herefordshire (St Mary) 1 (of 2)
1590 Yarpole, Herefordshire (St Leonard) 1 (of 3)
1591 Yazor, Herefordshire (St John) 1 (of 3)
1593 Albury, Hertfordshire (St Mary) 1 (of 4)
1594 Albury, Hertfordshire (St Mary) 2 (of 4)
1595 Anstey, Hertfordshire (St George) 6 (of 6)
1596 Ardeley, Hertfordshire (St Lawrence) 3 (of 6)
1597 Ardeley, Hertfordshire (St Lawrence) 6 (of 6)
1598 Ashwell, Hertfordshire (St Mary the Virgin) 6 (of 6)

1599 Ayott St Peter, Hertfordshire (St Peter) ? (of 3)
1600 Barkway, Hertfordshire (St Mary Magdalene) Clockbell (of 6)
1601 Barley, Hertfordshire (St Margaret) Clockbell (of 5)
1602 Bishop's Stortford, Hertfordshire (St Michael) 1 (of 5)
1603 Bishop's Stortford, Hertfordshire (St Michael) 2 (of 5)
1604 Bishop's Stortford, Hertfordshire (St Michael) 3 (of 5)
1605 Bishop's Stortford, Hertfordshire (St Michael) 4 (of 5)
1606 Bishop's Stortford, Hertfordshire (St Michael) 5 (of 5)
1607 Bramfield, Hertfordshire (St Andrew) 1 (of 1)
1608 Bushey, Hertfordshire (St James) 3 (of 3)
1609 Clothall, Hertfordshire (St Mary) 1 (of 2)
1610 Eastwick, Hertfordshire (St Botolph) 2 (of 3)
1611 Furneaux Pelham, Hertfordshire (St Mary) 3 (of 5)
1612 Great Amwell, Hertfordshire (St John the Baptist) 1 (of 3)
1613 Harpenden, Hertfordshire (St Nicholas) 4 (of 5)
1614 Hexton, Hertfordshire (St Faith) 2 (of 3)
1616 Kimpton, Hertfordshire (SS Peter & Paul) 4 (of 6)
1617 Kimpton, Hertfordshire (SS Peter & Paul) 5 (of 6)
1618 Letchworth, Hertfordshire (unknown) 1 (of 1)
1619 Little Berkhampstead, Hertfordshire (St Andrew) 2 (of 3)
1620 Little Hadham, Hertfordshire (St Cecilia) 3 (of 5)
1621 Little Hormead, Hertfordshire (St Mary) 1 (of 2)
1622 Little Hormead, Hertfordshire (St Mary) 2 (of 2)
1623 Little Munden, Hertfordshire (All Saints) 2 (of 5)
1624 Little Munden, Hertfordshire (All Saints) 4 (of 5)
1625 Little Wymondley, Hertfordshire (St Mary) 3 (of 3)
1626 Measden, Hertfordshire (St Mary) 2 (of 2)
1627 Ashbourne, Derbyshire (St Oswald) Sanctus bell (of 8)
1628 North Mimms, Hertfordshire (St Mary) Priest's bell (of 6)
1629 Norton, Hertfordshire (St Nicholas) 2 (of 3)
1630 Radwell, Hertfordshire (All Saints) 1 (of 2)
1631 St Albans, Hertfordshire (St Alban) Priest's bell (of 1)
1633 Sawbridgeworth, Hertfordshire (St Mary) 3 (of 6)
1634 Sawbridgeworth, Hertfordshire (St Mary) 5 (of 6)
1635 Shephall (Stevenage), Hertfordshire (St Mary) 1 (of 2)
1636 Stapleford, Hertfordshire (St Mary) 2 (of 2)
1637 Stocking Pelham, Hertfordshire (St Mary) ? (of 3)
1638 Thundridge, Hertfordshire (St Mary & All Saints) 1 (of 4)
1639 Welwyn, Hertfordshire (St Mary the Virgin) Priest's bell (of 1)
1640 Westmill, Hertfordshire (St Mary) 6 (of 8)
1641 Westmill, Hertfordshire (St Mary) 7 (of 8)
1642 Widford, Hertfordshire (St John the Baptist) 3 (of 5)
1643 Wyddial, Hertfordshire (St Giles) 1 (of 4)
1644 Wyddial, Hertfordshire (St Giles) 2 (of 4)
1645 Wyddial, Hertfordshire (St Giles) 3 (of 4)
1646 Adisham, Kent (Holy Innocents) 4 (of 4)
1647 Appledore, Kent (SS Peter & Paul) 3 (of 6)
1648 Appledore, Kent (SS Peter & Paul) Sanctus bell (of 6)
1649 Barfreston, Kent (St Nicholas) 1 (of 1)
1650 Barming, Kent (St Margaret) 2 (of 5)
1651 Bearstead, Kent (Holy Cross) 2 (of 6)
1652 Bethersden, Kent (St Margaret) 4 (of 6)
1653 Bilsington, Kent (SS Peter & Paul) ? (of 3)
1654 Bonnington, Kent (St Rumwold) 1 (of 1)
1655 Boughton Aluph, Kent (All Saints) 3 (of 5)
1656 Brenzett, Kent (St Eanswith) 3 (of 3)
1657 Bridge, Kent (St Peter) 1 (of 3)
1658 Bridge, Kent (St Peter) 2 (of 3)
1659 Bridge, Kent (St Peter) 3 (of 3)
1660 Brook, Kent (St Mary) 1 (of 3)
1661 Brook, Kent (St Mary) 2 (of 3)
1662 Brookland, Kent (St Augustine) 3 (of 5)
1663 Broomfield, Kent (St Margaret) 1 (of 3)
1664 Buckland by Dover, Kent (St Andrew) 2 (of 3)
1665 Burham, Kent (St Mary the Virgin) 2 (of 3)
1666 Burmarsh, Kent (All Saints) 1 (of 3)
1667 Burmarsh, Kent (All Saints) 2 (of 3)
1668 Burmarsh, Kent (All Saints) 3 (of 3)
1669 Canterbury, Kent (Holy Cross) 4 (of 5)
1670 Canterbury, Kent (St Alphege) 2 (of 3)
1671 Canterbury, Kent (St Dunstan) 5 (of 6)
1672 Canterbury, Kent (St George) 2 (of 4)
1673 Canterbury, Kent (St Martin) 1 (of 3)
1674 Canterbury, Kent (St Martin) 3 (of 3)
1675 Canterbury, Kent (St Mary Bredin) 2 (of 3)
1676 Canterbury, Kent (St Mary Bredin) 3 (of 3)
1677 Canterbury, Kent (St Mary Magdalene) 2 (of 3)
1678 Canterbury, Kent (St Mary Magdalene) 3 (of 3)
1679 Canterbury, Kent (St Mildred) ? (of ?)
1680 Canterbury, Kent (St Paul) 3 (of 3)
1681 Canterbury, Kent (St Peter) 2 (of 3)
1682 Canterbury, Kent (St Peter) 3 (of 3)

1683 Chalk, Kent (St Mary) 2 (of 3)
1684 Cheriton, Kent (St Martin) 4 (of 4)
1685 Church Hougham, Kent (St Lawrence) 3 (of 3)
1686 Coldred, Kent (St Pancras) 1 (of 1)
1687 Cowden, Kent (St Mary Magdalene) 3 (of 5)
1688 Cudham, Kent (SS Peter & Paul) 2 (of 4)
1689 Cuxton, Kent (St Michael) ? (of 3)
1690 Darenth, Kent (St Margaret) 1 (of 3)
1691 Denton, Kent (St Mary Magdalene) 2 (of 3)
1692 Denton, Kent (St Mary Magdalene) 3 (of 3)
1693 Dover, Kent (St Mary In Castro) 6 (of 6)
1694 Downe, Kent (St Mary the Virgin) ? (of 4)
1695 Downe, Kent (St Mary the Virgin) ? (of 4)
1696 Downe, Kent (St Mary the Virgin) ? (of 4)
1698 Eastwell, Kent (St Mary) 2 (of 3)
1699 East Wickham, Kent (St Michael) 2 (of 2)
1700 Eythorne, Kent (SS Peter & Paul) 2 (of 3)
1701 Eythorne, Kent (SS Peter & Paul) 3 (of 3)
1702 Fairfield, Kent (St Thomas of Canterbury) 1 (of 3)
1703 Fairfield, Kent (St Thomas of Canterbury) 2 (of 3)
1704 Fairfield, Kent (St Thomas of Canterbury) 3 (of 3)
1705 Frindsbury, Kent (All Saints) 3 (of 5)
1706 Goodnestone by Faversham, Kent (St Bartholomew) 1 (of 1)
1707 Goodnestone by Sandwich, Kent (Holy Cross) 1 (of 4)
1708 Goodnestone by Sandwich, Kent (Holy Cross) 2 (of 4)
1709 Graveney, Kent (All Saints) 1 (of 3)
1710 Great Chart, Kent (St Mary) 4 (of 5)
1711 Harbledown, Kent (St Michael) 3 (of 3)
1713 Hartley, Kent (All Saints) 1 (of 2)
1714 Hartlip, Kent (St Michael) 5 (of 6)
1715 Hawkinge, Kent (St Luke) 1 (of 1)
1716 Hinxhill, Kent (St Mary) 1 (of 2)
1717 Hoath, Kent (The Holy Trinity & St Mary) 2 (of 3)
1718 Hucking, Kent (St Margaret) 2 (of 2)
1719 Ightham, Kent (St Peter) 2 (of 5)
1720 Ightham, Kent (St Peter) 3 (of 5)
1721 Iwade, Kent (All Saints) 1 (of 2)
1722 Iwade, Kent (All Saints) 2 (of 2)
1723 Kemsing, Kent (St Mary) 1 (of 2)
1724 Kennington, Kent (St Mary) 1 (of 5)
1725 Kennington, Kent (St Mary) 3 (of 5)
1726 Kingsdown by Sittingbourne, Kent (St Mary) 1 (of 2)
1727 Kingsdown by Sittingbourne, Kent (St Mary) 2 (of 2)
1728 Kingston, Kent (St Giles) 1 (of 3)
1729 Kingston, Kent (St Giles) 3 (of 3)
1730 Langley, Kent (St Mary) 3 (of 3)
1732 Leybourne, Kent (SS Peter & Paul) ? (of ?)
1733 Longfield, Kent (St Mary Magdalene) 1 (of 1)
1734 Luddesdown, Kent (SS Peter & Paul) 1 (of 3)
1735 Luddesdown, Kent (SS Peter & Paul) 2 (of 3)
1736 Luddesdown, Kent (SS Peter & Paul) 3 (of 3)
1737 Lullingstone, Kent (St Botolph) 1 (of 1)
1738 Lydden, Kent (St Mary the Virgin) 1 (of 1)
1739 Lyminge, Kent (SS Mary & Eadburga) 5 (of 5)
1740 Margate, Kent (St John the Baptist) 3 (of 5)
1741 Margate, Kent (St John the Baptist) 4 (of 5)
1742 Margate, Kent (St John the Baptist) 5 (of 5)
1743 Milstead, Kent (St Mary & Holy Cross) 2 (of 3)
1744 Milstead, Kent (St Mary & Holy Cross) 3 (of 3)
1745 Molash, Kent (St Peter) 1 (of 3)
1746 Newington by Sittingbourne, Kent (St Mary the Virgin) 3 (of 6)
1747 Newnham, Kent (SS Peter & Paul) 1 (of 4)
1748 Newnham, Kent (SS Peter & Paul) 2 (of 4)
1749 Newnham, Kent (SS Peter & Paul) 4 (of 4)
1750 New Romney, Kent (St Nicholas) Service bell (of ?)
1751 Nonington, Kent (St Mary) 2 (of 3)
1752 Norton, Kent (St Mary) 1 (of 1)
1753 Nursted, Kent (St Mildred) 1 (of 1)
1754 Oare, Kent (St Peter) 1 (of 1)
1755 Old Romney, Kent (St Clement) 2 (of 3)
1756 Ospringe, Kent (SS Peter & Paul) ? (of ?)
1757 Otham, Kent (St Nicholas) 2 (of 3)
1758 Patrixbourne, Kent (St Mary) 2 (of 3)
1759 Penshurst, Kent (St John the Baptist) 3 (of 6)
1760 Penshurst, Kent (St John the Baptist) 4 (of 6)
1761 Petham, Kent (All Saints) 3 (of 3)
1762 Postling, Kent (St Mary the Virgin) 2 (of 3)
1763 Postling, Kent (St Mary the Virgin) 3 (of 3)
1764 Ringwould, Kent (St Nicholas) 3 (of 5)
1765 Rodmersham, Kent (St Nicholas) 1 (of 4)
1766 Ryarsh, Kent (St Martin) 3 (of 3)
1767 St Mary In The Marsh, Kent (St Mary) 1 (of 3)
1768 St Mary In The Marsh, Kent (St Mary) 2 (of 3)
1769 St Mary In The Marsh, Kent (St Mary) 3 (of 3)
1770 St Pauls Cray, Kent (St Paulinus) 2 (of 3)
1771 Sandhurst, Kent (St Nicholas) 4 (of 5)
1772 Seal, Kent (St Peter) 4 (of 5)
1773 Selling, Kent (St Mary) 1 (of 4)
1774 Selling, Kent (St Mary) 2 (of 4)
1775 Selling, Kent (St Mary) 3 (of 4)
1776 Shipbourne, Kent (St Giles the Abbot) 1 (of 4)
1777 Snargate, Kent (St Dunstan) 1 (of 3)
1778 Snargate, Kent (St Dunstan) 3 (of 3)
1779 Snave, Kent (St Augustine) 2 (of 3)
1780 Southfleet, Kent (St Nicholas) 5 (of 6)

1781 Stanford, Kent (All Saints) 1 (of 2)
1782 Stansted, Kent (St Mary) 1 (of 3)
1783 Staple, Kent (St James) 3 (of 4)
1784 Stelling, Kent (St Mary) 1 (of 3)
1785 Stelling, Kent (St Mary) 2 (of 3)
1786 Stelling, Kent (St Mary) 3 (of 3)
1787 Stodmarsh, Surrey (St Mary) 2 (of 2)
1788 Stodmarsh, Surrey (St Mary) 1 (of 2)
1789 Stone In Oxney, Kent (St Mary) 3 (of 6)
1790 Stowting, Kent (St Mary) 2 (of 4)
1791 Sutton At Hone, Kent (St John the Baptist) 1 (of 3)
1792 Sutton At Hone, Kent (St John the Baptist) 3 (of 3)
1793 Sutton by Dover, Kent (SS Peter & Paul) 1 (of 1)
1794 Tenterden, Kent (St Mildred) Priest's bell (of 1)
1795 Tonge, Kent (St Giles) 2 (of 3)
1796 Upper Hardres, Kent (SS Peter & Paul) 3 (of 3)
1797 West Cliffe, Kent (St Peter) 1 (of 1)
1798 Whitfield, Kent (St Peter) 1 (of 1)
1799 Worth, Kent (SS Peter & Paul) 1 (of 2)
1800 Wychling, Kent (St Margaret) 2 (of 3)
1801 Denton, Kent (St Mary Magdalene) 1 (of 3)
1802 Aldingham, Lancashire (St Cuthbert) 2 (of 3)
1803 Aldingham, Lancashire (St Cuthbert) 3 (of 3)
1804 Arkholme, Lancashire (St John the Baptist) 1 (of 1)
1805 Bolton-Le-Sands, Lancashire (St Michael) 3 (of 3)
1806 Bradshaw, Lancashire (St Maxentius) 1 (of 1)
1807 Brindle, Lancashire (St Helen) 4 (of 6)
1808 Brindle, Lancashire (St Helen) 5 (of 6)
1809 Broughton, Lancashire (St John the Baptist) 1 (of 3)
1810 Broughton-in-Furness, Lancashire (St Mary Magdalene) 1 (of 2)
1811 Cartmel Fell, Lancashire (St Anthony) 2 (of 2)
1812 Church Kirk, Lancashire (St James) 1 (of 2)
1813 Claughton, Lancashire (St Chad) 2 (of 2)
1814 Colton, Lancashire (The Holy Trinity) 1 (of 1)
1815 Dalton, Lancashire (St Mary) 1 (of 3)
1816 Downham, Lancashire (St Leonard) 1 (of 3)
1817 Downham, Lancashire (St Leonard) 2 (of 3)
1818 Downham, Lancashire (St Leonard) 3 (of 3)
1819 Halton, Lancashire (St Wilfrid) 1 (of 3)
1820 Halton, Lancashire (St Wilfrid) 2 (of 3)
1822 Huyton, Lancashire (St Michael) 4 (of 4)
1823 Kirkby Ireleth, Lancashire (St Cuthbert) ? (of 3)
1824 Longridge, Lancashire (St Lawrence) 1 (of 2)
1826 Over Kellet, Lancashire (St Cuthbert) 2 (of 3)
1827 St Michael-on-Wyre, Lancashire (St Michael) 1 (of 3)
1828 Samlesbury, Lancashire (St Leonard) ? (of 2)
1829 Urswick, Lancashire (St Mary) 3 (of 3)
1830 Abbotsleigh, Huntingdonshire (St Margaret) 3 (of 5)
1831 Abbot's Ripton, Huntingdonshire (St Andrew) 1 (of 3)
1832 Brampton, Huntingdonshire (St Mary) 3 (of 5)
1833 Buckden, Huntingdonshire (St Mary) 1 (of 5)
1834 Buckworth, Huntingdonshire (All Saints) 5 (of 5)
1835 Bury, Huntingdonshire (Holy Cross) 2 (of 3)
1836 Chesterton, Huntingdonshire (St Michael) 2 (of 3)
1837 Chesterton, Huntingdonshire (St Michael) 3 (of 3)
1838 Denton, Huntingdonshire (All Saints) 1 (of 2)
1839 Ellington, Huntingdonshire (All Saints) 2 (of 4)
1840 Ellington, Huntingdonshire (All Saints) 3 (of 4)
1841 Grafham, Huntingdonshire (All Saints) 2 (of 3)
1842 Great Catworth, Huntingdonshire (St Leonard) 1 (of 4)
1843 Great Paxton, Huntingdonshire (The Holy Trinity) 1 (of 5)
1844 Great Paxton, Huntingdonshire (The Holy Trinity) 4 (of 5)
1845 Great Staughton, Huntingdonshire (St Andrew) 3 (of 5)
1846 Great Staughton, Huntingdonshire (St Andrew) Disused (of 5)
1847 Haddon, Huntingdonshire (St Mary) 1 (of 3)
1848 Huntingdon, Huntingdonshire (St Mary) 3 (of 6)
1849 Huntingdon, Huntingdonshire (St Mary) 4 (of 6)
1850 Huntingdon, Huntingdonshire (St Mary) 6 (of 6)
1851 King's Ripton, Huntingdonshire (St Peter) 1 (of 3)
1852 King's Ripton, Huntingdonshire (St Peter) 3 (of 3)
1853 Orton Longueville, Huntingdonshire (The Holy Trinity) 1 (of 1)
1854 Orton Longueville, Huntingdonshire (The Holy Trinity) Sanctus bell (of 1)
1855 Ramsey, Huntingdonshire (St Thomas of Canterbury) Priest's bell (of 6)
1856 Sawtry, Huntingdonshire (All Saints) 1 (of 2)

1857 Sawtry, Huntingdonshire (All Saints) 2 (of 2)
1858 Steeple Gidding, Huntingdonshire (St Andrew) 1 (of 3)
1859 Steeple Gidding, Huntingdonshire (St Andrew) 2 (of 3)
1860 Stilton, Huntingdonshire (St Mary) 2 (of 2)
1861 Stow Longa, Huntingdonshire (St Botolph) 1 (of 1)
1862 Thurning, Northamptonshire (St James) 1 (of 2)
1863 Thurning, Northamptonshire (St James) 2 (of 2)
1864 Water Newton, Huntingdonshire (St Remigius) 1 (of 3)
1865 Water Newton, Huntingdonshire (St Remigius) 3 (of 3)
1866 Ashby-De-La-Zouch, Leicestershire (St Helen) 6 (of 8)
1867 Aston Flamville, Leicestershire (St Peter) 2 (of 2)
1868 Ayleston, Leicestershire (St Andrew) 1 (of 4)
1869 Barkby, Leicestershire (St Mary) 3 (of 5)
1870 Barleston, Leicestershire (St Giles) 2 (of 2)
1871 Beeby, Leicestershire (All Saints) 3 (of 3)
1872 Billesdon, Leicestershire (St John the Baptist) 4 (of 4)
1873 Birstall, Leicestershire (St James) 3 (of 3)
1874 Bottesford, Leicestershire (St Mary) 4 (of 6)
1875 Bottesford, Leicestershire (St Mary) 6 (of 6)
1876 Breedon, Leicestershire (SS Mary & Hardulph) 3 (of ?)
1879 Castle Donington, Leicestershire (St Edward, King & Martyr) 4 (of 5)
1880 Catthorpe, Leicestershire (St Mary & All Saints) 1 (of 3)
1881 Catthorpe, Leicestershire (St Mary & All Saints) 2 (of 3)
1882 Chadwell, Leicestershire (St Mary) 1 (of 3)
1883 Chadwell, Leicestershire (St Mary) 2 (of 3)
1884 Chadwell, Leicestershire (St Mary) 3 (of 3)
1885 Claybrooke, Leicestershire (St Peter) 4 (of 4)
1886 Cold Overton, Leicestershire (St John the Baptist) 2 (of 3)
1887 Cossington, Leicestershire (All Saints) 1 (of 4)
1888 Cossington, Leicestershire (All Saints) 2 (of 4)
1889 Cossington, Leicestershire (All Saints) 3 (of 4)
1890 Coston, Leicestershire (St Andrew) 3 (of 3)
1891 Cottesbach, Leicestershire (St Mary) 2 (of 2)
1892 Cranoe, Leicestershire (St Michael) 1 (of 2)
1893 Cranoe, Leicestershire (St Michael) 2 (of 2)
1894 Croxton Kerrial, Leicestershire (St John) 3 (of 5)
1895 Croxton Kerrial, Leicestershire (St John) Sanctus bell (of 5)
1896 Dalby Parva, Leicestershire (St James) 2 (of 3)
1897 Dalby Parva, Leicestershire (St James) 3 (of 3)
1898 Fenny Drayton, Leicestershire (St Michael) 1 (of 4)
1899 Foxton, Leicestershire (St Andrew) 3 (of 5)
1900 Frolesworth, Leicestershire (St Nicholas) 3 (of 3)
1901 Glen-Magna, Leicestershire (St Cuthbert) 5 (of 5)
1902 Gumley, Leicestershire (St Helen) 3 (of 3)
1903 Horninghold, Leicestershire (St Peter) 1 (of 3)
1904 Hose, Leicestershire (St Michael) 2 (of 3)
1905 Hungarton, Leicestershire (St John the Baptist) 2 (of 3)
1906 Hungarton, Leicestershire (St John the Baptist) 3 (of 3)
1907 Ibstock, Leicestershire (St Denis) 4 (of 4)
1908 Kegworth, Leicestershire (St Andrew) 3 (of 5)
1909 Leicester, Leicestershire (All Saints) 2 (of 5)
1910 Leicester, Leicestershire (All Saints) 5 (of 5)
1911 Loddington, Leicestershire (St Michael) 1 (of 3)
1912 Long Clawson, Leicestershire (St Remigius) 4 (of 5)
1913 Loughborough, Leicestershire (All Saints) 2 (of 6)
1914 Loughborough, Leicestershire (All Saints) 3 (of 6)
1915 Markfield, Leicestershire (St Michael) 3 (of 3)
1916 Melton Mowbray, Leicestershire (St Mary) 4 (of 8)
1917 Muston, Leicestershire (St John the Baptist) 1 (of 4)
1918 Newton Harcourt, Leicestershire (St Luke) 1 (of 1)
1919 Owston, Leicestershire (St Andrew) 1 (of 3)
1920 Pickwell, Leicestershire (All Saints) 1 (of 3)
1921 Pickwell, Leicestershire (All Saints) 3 (of 3)
1922 Ragdale, Leicestershire (All Saints) 1 (of 2)
1923 Ragdale, Leicestershire (All Saints) 2 (of 2)
1924 Ratby, Leicestershire (St George) 4 (of 4)
1925 Rearsby, Leicestershire (St Michael) 3 (of 3)
1926 Rotherby, Leicestershire (All Saints) 2 (of 3)
1927 Saltby, Leicestershire (St Peter) 2 (of 3)
1928 Saltby, Leicestershire (St Peter) 3 (of 3)
1929 Sapcote, Leicestershire (All Saints) 3 (of 4)
1930 Seagrave, Leicestershire (All Saints) 2 (of 3)
1931 Shawell, Leicestershire (All Saints) 4 (of 5)
1933 Sproxton, Leicestershire (St Bartholomew) 1 (of 3)
1934 Sproxton, Leicestershire (St Bartholomew) 2 (of 3)

1935 Sproxton, Leicestershire (St Bartholomew) 3 (of 3)
1936 Swinford, Leicestershire (All Saints) 4 (of 4)
1938 Syston, Leicestershire (St Peter) 4 (of 6)
1939 Thrussington, Leicestershire (The Holy Trinity) 1 (of 3)
1940 Thrussington, Leicestershire (The Holy Trinity) 3 (of 3)
1941 Thurcaston, Leicestershire (All Saints) 3 (of 3)
1942 Walton Isley, Leicestershire (All Saints) 1 (of 2)
1943 Walton Isley, Leicestershire (All Saints) 2 (of 2)
1944 Wanlip, Leicestershire (St Nicholas) 2 (of 3)
1945 Wanlip, Leicestershire (St Nicholas) 3 (of 3)
1947 Welham, Leicestershire (St Andrew) 3 (of ?)
1948 Willoughby Waterless, Leicestershire (St Mary) 3 (of 4)
1949 Witherley, Leicestershire (St Peter) 5 (of 5)
1950 Wyfordby, Leicestershire (St Mary) 1 (of 2)
1951 Wyfordby, Leicestershire (St Mary) 2 (of 2)
1952 Alford, Lincolnshire (St Wilfrid) Priest's bell (of 5)
1953 Althorpe, Lincolnshire (St Oswald) 1 (of 3)
1954 Althorpe, Lincolnshire (St Oswald) 2 (of 3)
1955 Alvingham, Lincolnshire (St Adelwold) 2 (of 3)
1956 Alvingham, Lincolnshire (St Adelwold) 3 (of 3)
1957 Alkborough, Lincolnshire (St John the Baptist) 1 (of 3)
1958 Alkborough, Lincolnshire (St John the Baptist) 2 (of 3)
1959 Appleby, Lincolnshire (St Bartholomew) 5 (of 6)
1960 Asgarby, Lincolnshire (St Andrew) 1 (of 3)
1961 Asgarby, Lincolnshire (St Andrew) 2 (of 3)
1962 Asgarby, Lincolnshire (St Andrew) 3 (of 3)
1963 Ashby Puerorum, Lincolnshire (St Andrew) 1 (of 2)
1964 Ashby Puerorum, Lincolnshire (St Andrew) 2 (of 2)
1965 Aslackby, Lincolnshire (St James) 3 (of 3)
1966 Asterby, Lincolnshire (St Peter) 1 (of 3)
1967 Asterby, Lincolnshire (St Peter) 3 (of 3)
1968 Aswarby, Lincolnshire (St Denis) 1 (of 3)
1969 Aubourn, Lincolnshire (St Peter) 1 (of 1)
1970 Aylesby, Lincolnshire (St Lawrence) 3 (of 3)
1971 Barnetby-Le-Wold, Lincolnshire (St Mary) 1 (of 3)
1972 Barnetby-Le-Wold, Lincolnshire (St Mary) 3 (of 3)
1973 Barholm, Lincolnshire (St Martin) 1 (of 3)
1974 Barnoldby-Le-Beck, Lincolnshire (St Helen) 1 (of 3)
1975 Barrowby, Lincolnshire (All Saints) 2 (of 4)
1976 Barrowby, Lincolnshire (All Saints) 3 (of 4)
1977 Bassingthorpe, Lincolnshire (St Thomas of Canterbury) 1 (of 4)
1978 Bassingthorpe, Lincolnshire (St Thomas of Canterbury) 3 (of 4)
1979 Beesby, Lincolnshire (St Andrew) 1 (of 3)
1980 Beesby, Lincolnshire (St Andrew) 3 (of 3)
1981 Belleau, Lincolnshire (St John) 3 (of 3)
1982 Belton (near Grantham), Lincolnshire (SS Peter & Paul) 2 (of 5)
1983 Belton (near Grantham), Lincolnshire (SS Peter & Paul) 4 (of 5)
1984 Bicker, Lincolnshire (St Swithin) Priest's bell (of 6)
1985 Bilsby, Lincolnshire (The Holy Trinity) 1 (of 1)
1986 Bishop Norton, Lincolnshire (St Peter) 1 (of 3)
1987 Bishop Norton, Lincolnshire (St Peter) 2 (of 3)
1988 Bitchfield, Lincolnshire (St Mary Magdalene) 1 (of 3)
1989 Bitchfield, Lincolnshire (St Mary Magdalene) 2 (of 3)
1990 Bloxholm, Lincolnshire (St Mary the Virgin) 1 (of 2)
1991 Bloxholm, Lincolnshire (St Mary the Virgin) 2 (of 2)
1992 Bonby, Lincolnshire (St Andrew) 1 (of 3)
1993 Boothby Graffoe, Lincolnshire (St Andrew) 1 (of 3)
1994 Boothby Graffoe, Lincolnshire (St Andrew) 2 (of 3)
1995 Boothby Graffoe, Lincolnshire (St Andrew) 3 (of 3)
1996 Boothby Pagnell, Lincolnshire (St Andrew) 1 (of 3)
1997 Boultham, Lincolnshire (St Helen) 1 (of 1)
1998 Bracebridge, Lincolnshire (All Saints) 1 (of 1)
1999 Branston, Lincolnshire (All Saints) 3 (of 4)
2000 Bratoft, Lincolnshire (SS Peter & Paul) 1 (of 3)
2001 Bratoft, Lincolnshire (SS Peter & Paul) 2 (of 3)
2002 Bratoft, Lincolnshire (SS Peter & Paul) 3 (of 3)
2003 Brattleby, Lincolnshire (St Cuthbert) 1 (of 3)
2004 Brattleby, Lincolnshire (St Cuthbert) 3 (of 3)
2005 Brigsley, Lincolnshire (St Helen) 2 (of 3)
2006 Broughton, Lincolnshire (St Mary) 1 (of 2)
2007 Broughton, Lincolnshire (St Mary) 2 (of 2)
2008 Bucknall, Lincolnshire (St Margaret) 1 (of 1)
2009 Burton-by-Lincoln, Lincolnshire (St Vincent) 1 (of 1)
2010 Burton Coggles, Lincolnshire (St Thomas of Canterbury) 3 (of 3)
2011 Burwell, Lincolnshire (St Michael) 2 (of 2)

2012 Bytham Castle, Lincolnshire (St James) 1 (of 3)
2013 Caistor, Lincolnshire (SS Peter & Paul) 5 (of 6)
2014 Canwick, Lincolnshire (All Saints) 1 (of 2)
2015 Canwick, Lincolnshire (All Saints) 2 (of 2)
2016 Careby, Lincolnshire (St Stephen) 2 (of 2)
2017 Carlby, Lincolnshire (St Stephen) 1 (of 1)
2018 Carlton Scroop, Lincolnshire (St Nicholas) 2 (of 3)
2019 Claxby, Lincolnshire (St Mary) 2 (of 3)
2020 Claxby, Lincolnshire (St Mary) 3 (of 3)
2021 Covenham St Bartholomew, Lincolnshire (St Bartholomew) 1 (of 3)
2022 Covenham St Bartholomew, Lincolnshire (St Bartholomew) 3 (of 3)
2023 Covenham St Mary, Lincolnshire (St Mary) 1 (of 3)
2024 Cowbit, Lincolnshire (St Mary) 1 (of 3)
2025 Cowbit, Lincolnshire (St Mary) 2 (of 3)
2026 Creeton, Lincolnshire (St Peter) 1 (of 2)
2027 Crowland, Lincolnshire (SS Guthlac & Bartholomew) 2 (of 3)
2028 Crowland, Lincolnshire (SS Guthlac & Bartholomew) 3 (of 3)
2029 Crowland, Lincolnshire (SS Guthlac & Bartholomew) 1 (of 3)
2030 Deeping St James, Lincolnshire (St James) 3 (of 5)
2031 Dowsby, Lincolnshire (St Andrew) 2 (of 3)
2032 Dry Doddington, Lincolnshire (St James) 1 (of 1)
2033 Dunsby, Lincolnshire (All Saints) 1 (of 2)
2034 Dunsby, Lincolnshire (All Saints) 2 (of 2)
2035 Dunston, Lincolnshire (St Peter) 1 (of 3)
2036 East Halton, Lincolnshire (St Peter) 2 (of 3)
2037 East Kirkby, Lincolnshire (St Nicholas) 2 (of 2)
2038 Edlington, Lincolnshire (St Helen) 2 (of 3)
2039 Edlington, Lincolnshire (St Helen) 3 (of 3)
2040 Enderby Bag, Lincolnshire (St Margaret) 1 (of 1)
2041 Enderby Mavis, Lincolnshire (St Michael) 3 (of 3)
2042 Enderby Wood, Lincolnshire (St Benedict) 1 (of 1)
2043 Faldingworth, Lincolnshire (All Saints) 1 (of 3)
2044 Faldingworth, Lincolnshire (All Saints) Priest's bell (of 3)
2045 Fenton, Lincolnshire (All Saints) 1 (of 3)
2046 Fiskerton, Lincolnshire (St Clement) 2 (of 3)
2047 Frieston, Lincolnshire (St James) 4 (of 5)
2048 Friesthorp, Lincolnshire (St Peter) 2 (of 3)
2049 Friesthorp, Lincolnshire (St Peter) 3 (of 3)
2050 Frodingham, Lincolnshire (St Lawrence) 3 (of 3)
2051 Gautby, Lincolnshire (All Saints) 1 (of 1)
2052 Goulceby, Lincolnshire (All Saints) 1 (of 1)
2053 Grainthorpe, Lincolnshire (St Clement) 1 (of 3)
2054 Grainthorpe, Lincolnshire (St Clement) 2 (of 3)
2055 Grantham, Lincolnshire (St Wulfram) ? (of 6)
2056 Grantham, Lincolnshire (St Wulfram) ? (of 6)
2057 Grasby, Lincolnshire (All Saints) 1 (of 4)
2058 Grayingham, Lincolnshire (St Radegund) 1 (of 3)
2059 Grayingham, Lincolnshire (St Radegund) 2 (of 3)
2060 Great Gonerby, Lincolnshire (St Sebastian) 1 (of 3)
2061 Great Gonerby, Lincolnshire (St Sebastian) 3 (of 3)
2062 Great Ponton, Lincolnshire (Holy Cross) 2 (of 5)
2063 Great Ponton, Lincolnshire (Holy Cross) 3 (of 5)
2064 Greetwell, Lincolnshire (All Saints) 1 (of 1)
2065 Grimolby, Lincolnshire (St Edith) 1 (of 3)
2066 Grimolby, Lincolnshire (St Edith) 2 (of 3)
2067 Gunby, Lincolnshire (St Nicholas) 2 (of 3)
2068 Gunby St Peter, Lincolnshire (St Peter) 2 (of 3)
2069 Gunby St Peter, Lincolnshire (St Peter) 3 (of 3)
2070 Hacconby, Lincolnshire (St Andrew) Priest's bell (of 4)
2071 Hacconby, Lincolnshire (St Andrew) 4 (of 4)
2072 Hackthorn, Lincolnshire (St Michael) 1 (of 1)
2073 Hagworthingham, Lincolnshire (The Holy Trinity) 5 (of 8)
2074 Hainton, Lincolnshire (St Mary) 3 (of 3)
2075 Hale Magna, Lincolnshire (St John the Baptist) 3 (of 4)
2076 Hale Magna, Lincolnshire (St John the Baptist) Priest's bell (of 4)
2077 Haltham-on-Bain, Lincolnshire (St Benedict) 3 (of 3)
2078 Hammeringham, Lincolnshire (All Saints) 1 (of 1)
2079 Harlaxton, Lincolnshire (SS Mary & Peter) 4 (of 5)
2080 Harpswell, Lincolnshire (St Chad) 1 (of 2)
2081 Harpswell, Lincolnshire (St Chad) 2 (of 2)
2082 Hatcliffe, Lincolnshire (St Mary) 1 (of 1)
2083 Hawerby, Lincolnshire (St Margaret) 2 (of 2)
2084 Haxey, Lincolnshire (St Nicholas) 4 (of 6)
2085 Haxey, Lincolnshire (St Nicholas) 5 (of 6)
2086 Haxey, Lincolnshire (St Nicholas) 6 (of 6)
2087 Heapham, Lincolnshire (All Saints) 1 (of 2)
2088 Hemswell, Lincolnshire (All Saints) 1 (of 2)

2089 Holton-Le-Beckering, Lincolnshire (All Saints) 1 (of 3)
2090 Holton-Le-Clay, Lincolnshire (St Peter) 1 (of 3)
2091 Holton-Le-Clay, Lincolnshire (St Peter) 2 (of 3)
2092 Holton-Le-Clay, Lincolnshire (St Peter) 3 (of 3)
2093 Holywell, Lincolnshire (St Mary) 2 (of 2)
2094 Honington, Lincolnshire (St Wilfrid) 2 (of 3)
2095 Horkstow, Lincolnshire (St Maurice) 2 (of 3)
2096 Horkstow, Lincolnshire (St Maurice) 3 (of 3)
2097 Horncastle, Lincolnshire (St Mary) Clockbell (of 6)
2098 Horsington, Lincolnshire (All Saints) 1 (of 1)
2099 Hough-on-the-Hill, Lincolnshire (All Saints) 1 (of 3)
2100 Hough-on-the-Hill, Lincolnshire (All Saints) 2 (of 3)
2101 Hough-on-the-Hill, Lincolnshire (All Saints) 3 (of 3)
2102 Hundleby, Lincolnshire (St Mary) 1 (of 3)
2103 Immingham, Lincolnshire (St Andrew) 1 (of 3)
2104 Immingham, Lincolnshire (St Andrew) 2 (of 3)
2105 Immingham, Lincolnshire (St Andrew) 3 (of 3)
2106 Ingoldmells, Lincolnshire (SS Peter & Paul) Priest's bell (of 4)
2107 Ingoldsby, Lincolnshire (St Bartholomew) 1 (of 3)
2108 Keddington, Lincolnshire (St Margaret) 1 (of 1)
2109 Kettlethorpe, Lincolnshire (SS Peter & Paul) 3 (of 3)
2110 Killingholme, Lincolnshire (St Denis) 3 (of 4)
2111 Killingholme, Lincolnshire (St Denis) 4 (of 4)
2112 Kirkby-Cum-Osgodby, Lincolnshire (St Andrew) 3 (of 3)
2113 Laceby, Lincolnshire (St Margaret) 1 (of 3)
2114 Laceby, Lincolnshire (St Margaret) 2 (of 3)
2115 Laceby, Lincolnshire (St Margaret) Priest's bell (of 3)
2116 Laughton, Lincolnshire (All Saints) 2 (of 3)
2117 Lavington, Lincolnshire (St Peter) 1 (of 3)
2118 Lavington, Lincolnshire (St Peter) 2 (of 3)
2119 Leasingham, Lincolnshire (St Andrew) 4 (of 4)
2120 Legbourne, Lincolnshire (All Saints) 2 (of 3)
2122 Lincoln, Lincolnshire (St Mary Magdalene) 1 (of 1)
2123 Lincoln, Lincolnshire (St Peter-in-Eastgate) 1 (of 1)
2124 Lincoln, Lincolnshire (St Peter-At-Gowts) 3 (of 3)
2125 Linwood, Lincolnshire (St Cornelius) 2 (of 3)
2126 Linwood, Lincolnshire (St Cornelius) 3 (of 3)
2127 Little Steeping, Lincolnshire (St Andrew) 2 (of 3)
2128 Little Steeping, Lincolnshire (St Andrew) 3 (of 3)
2129 Luddington, Lincolnshire (St Oswald) ? (of 2)
2130 Luddington, Lincolnshire (St Oswald) ? (of 2)
2131 Ludford Magna, Lincolnshire (St Mary) 1 (of 1)
2132 Maltby-Le-Marsh, Lincolnshire (All Saints) 1 (of 2)
2133 Maltby-Le-Marsh, Lincolnshire (All Saints) 2 (of 2)
2134 Manby, Lincolnshire (St Mary) 1 (of 3)
2135 Manby, Lincolnshire (St Mary) 2 (of 3)
2136 Manby, Lincolnshire (St Mary) 3 (of 3)
2137 Manton, Lincolnshire (St Hibald) 1 (of 1)
2138 Markby, Lincolnshire (St Peter) 1 (of 1)
2139 Market Stainton, Lincolnshire (St Michael) 1 (of 3)
2140 Marton, Lincolnshire (St Margaret) 1 (of 3)
2141 Mumby, Lincolnshire (St Peter) 2 (of 4)
2142 Mumby, Lincolnshire (St Peter) 3 (of 4)
2143 Navenby, Lincolnshire (St Peter) 2 (of 3)
2144 Navenby, Lincolnshire (St Peter) 3 (of 3)
2145 Nettleton, Lincolnshire (St John the Baptist) 1 (of 3)
2146 Normanby near Spital, Lincolnshire (SS Peter & Paul) 3 (of 3)
2147 Normanton, Lincolnshire (St Nicholas) 2 (of 3)
2149 North Cockerington, Lincolnshire (St Mary) 1 (of 3)
2150 North Cockerington, Lincolnshire (St Mary) 2 (of 3)
2151 North Elkington, Lincolnshire (St Helen) 1 (of 1)
2153 North Somercotes, Lincolnshire (St Peter) 1 (of 3)
2154 North Thoresby, Lincolnshire (St Helen) 3 (of 3)
2155 North Witham, Lincolnshire (St Mary) 1 (of 3)
2156 North Witham, Lincolnshire (St Mary) 3 (of 3)
2157 North Witham, Lincolnshire (St Mary) Priest's bell (of 3)
2158 Norton Disney, Lincolnshire (All Saints) 2 (of 3)
2161 Orby, Lincolnshire (All Saints) 3 (of 3)
2162 Osbournby, Lincolnshire (SS Peter & Paul) 3 (of 3)

2163 Partney, Lincolnshire (St Nicholas) 3 (of 3)
2164 Pickworth, Lincolnshire (St Andrew) 2 (of 2)
2165 Quadring, Lincolnshire (St Margaret) 1 (of 4)
2166 Quadring, Lincolnshire (St Margaret) 2 (of 4)
2167 Quadring, Lincolnshire (St Margaret) 4 (of 4)
2168 Quarrington, Lincolnshire (St Botolph) 2 (of 2)
2169 Raithby-by-Spilsby, Lincolnshire (The Holy Trinity) 1 (of 3)
2170 Raithby-by-Spilsby, Lincolnshire (The Holy Trinity) 2 (of 3)
2171 Rand, Lincolnshire (St Oswald) 2 (of 2)
2172 Reepham, Lincolnshire (SS Peter & Paul) 1 (of 1)
2173 Rigsby, Lincolnshire (St James) 1 (of 1)
2174 Rothwell, Lincolnshire (St Mary) 2 (of 3)
2175 Rothwell, Lincolnshire (St Mary) 3 (of 3)
2176 Rowston, Lincolnshire (St Clement) 1 (of 2)
2177 Rowston, Lincolnshire (St Clement) 2 (of 2)
2178 Roxby-Cum-Risby, Lincolnshire (St Mary) 3 (of 3)
2179 Saleby, Lincolnshire (St Margaret) ? (of ?)
2180 Saltfleetby St Clement, Lincolnshire (St Clement) 2 (of 3)
2181 Saltfleetby St Clement, Lincolnshire (St Clement) 3 (of 3)
2182 Saltfleetby St Peter, Lincolnshire (St Peter) 1 (of 2)
2183 Saltfleetby St Peter, Lincolnshire (St Peter) 2 (of 2)
2184 Sausthorpe, Lincolnshire (St Andrew) 1 (of 3)
2185 Sausthorpe, Lincolnshire (St Andrew) 2 (of 3)
2186 Sausthorpe, Lincolnshire (St Andrew) 3 (of 3)
2187 Saxilby, Lincolnshire (St Botolph) 2 (of 4)
2188 Scampton, Lincolnshire (St John the Baptist) 1 (of 3)
2189 Scampton, Lincolnshire (St John the Baptist) 2 (of 3)
2190 Scawby, Lincolnshire (St Hibald) 3 (of 3)
2191 Scopwick, Lincolnshire (Holy Cross) 3 (of 3)
2192 Scothorne, Lincolnshire (St Germanus) 1 (of 3)
2193 Scothorne, Lincolnshire (St Germanus) Sanctus bell (of 3)
2194 Scotton, Lincolnshire (St Genewys) 2 (of 3)
2195 Scot Willoughby, Lincolnshire (St Andrew) 1 (of 1)
2196 Sedgebrooke, Lincolnshire (St Lawrence) 2 (of 3)
2197 Sedgebrooke, Lincolnshire (St Lawrence) 3 (of 3)
2198 Semperingham, Lincolnshire (St Andrew) 2 (of 3)
2199 Six Hills, Lincolnshire (All Saints) 1 (of 3)
2200 Six Hills, Lincolnshire (All Saints) 2 (of 3)
2201 Skegness, Lincolnshire (St Clement) 1 (of 1)
2202 Skendleby, Lincolnshire (St Peter) 3 (of 3)
2203 Somerby, Lincolnshire (St Margaret) 1 (of 3)
2204 Somerby, Lincolnshire (St Margaret) 3 (of 3)
2205 Somersby, Lincolnshire (St Margaret) 1 (of 2)
2206 Somersby, Lincolnshire (St Margaret) 2 (of 2)
2207 Sotby, Lincolnshire (St Peter) 1 (of 1)
2208 South Carlton, Lincolnshire (St Andrew) 1 (of 1)
2209 South Elkington, Lincolnshire (All Saints) 1 (of 3)
2210 South Elkington, Lincolnshire (All Saints) 2 (of 3)
2211 South Elkington, Lincolnshire (All Saints) 3 (of 3)
2212 South Kelsey, Lincolnshire (St Mary) 3 (of 3)
2213 South Ormsby, Lincolnshire (St Leonard) 3 (of 5)
2214 South Ormsby, Lincolnshire (St Leonard) 4 (of 5)
2215 South Ormsby, Lincolnshire (St Leonard) 5 (of 5)
2216 South Somercotes, Lincolnshire (St Mary) 1 (of 3)
2217 South Somercotes, Lincolnshire (St Mary) 2 (of 3)
2218 South Somercotes, Lincolnshire (St Mary) 3 (of 3)
2219 South Willingham, Lincolnshire (St Martin) 2 (of 3)
2221 Springthorpe, Lincolnshire (SS George & Lawrence) 3 (of 3)
2222 Stamford, Lincolnshire (All Saints) 1 (of 5)
2223 Stamford, Lincolnshire (All Saints) 2 (of 5)
2224 Stamford, Lincolnshire (All Saints) 3 (of 5)
2225 Stamford, Lincolnshire (St George) 3 (of 4)
2226 Stamford, Lincolnshire (St John the Baptist) 3 (of 4)
2227 Stamford, Lincolnshire (St Mary) 4 (of 8)
2228 Stamford, Lincolnshire (St Mary) 6 (of 8)
2229 Stickford, Lincolnshire (St Helen) 1 (of 1)
2230 Stickney, Lincolnshire (St Luke) 3 (of 4)
2231 Stixwold, Lincolnshire (St Peter) 1 (of 2)
2232 Sturton Magna, Lincolnshire (All Saints) 1 (of 1)
2233 Sutterton, Lincolnshire (St Mary the Virgin) Priest's bell (of 8)
2234 Sutton-Le-Marsh, Lincolnshire (St Clement) 1 (of 3)

2235 Swarby, Lincolnshire (St Mary & All Saints) 1 (of 1)
2236 Swinderby, Lincolnshire (All Saints) 1 (of 3)
2237 Swinderby, Lincolnshire (All Saints) 3 (of 3)
2238 Swineshead, Lincolnshire (St Mary) 1 (of 4)
2239 Swineshead, Lincolnshire (St Mary) 4 (of 4)
2240 Swinstead, Lincolnshire (St Mary) 4 (of 4)
2241 Tallington, Lincolnshire (St Lawrence) 2 (of 3)
2242 Tallington, Lincolnshire (St Lawrence) 3 (of 3)
2243 Tallington, Lincolnshire (St Lawrence) Priest's bell (of 3)
2244 Tealby, Lincolnshire (All Saints) 1 (of 4)
2245 Tealby, Lincolnshire (All Saints) 2 (of 4)
2246 Tetford, Lincolnshire (St Mary) 3 (of 3)
2247 Theddlethorpe St Helen, Lincolnshire (St Helen) 1 (of 3)
2248 Theddlethorpe St Helen, Lincolnshire (St Helen) 2 (of 3)
2249 Theddlethorpe St Helen, Lincolnshire (St Helen) 3 (of 3)
2250 Thorpe St Peter, Lincolnshire (St Peter) 1 (of 3)
2251 Thorpe St Peter, Lincolnshire (St Peter) 2 (of 3)
2252 Thurlby, Lincolnshire (St Germanus) 1 (of 3)
2253 Torksey, Lincolnshire (St Peter) 1 (of 3)
2254 Torksey, Lincolnshire (St Peter) 2 (of 3)
2255 Toynton St Peter, Lincolnshire (St Peter) 1 (of 2)
2256 Toynton St Peter, Lincolnshire (St Peter) 2 (of 2)
2257 Trusthorpe, Lincolnshire (St Peter) 1 (of 3)
2258 Trusthorpe, Lincolnshire (St Peter) 2 (of 3)
2259 Trusthorpe, Lincolnshire (St Peter) 3 (of 3)
2260 Waddingham, Lincolnshire (St Mary) 2 (of 3)
2261 Waddingham, Lincolnshire (St Mary) Priest's bell (of 3)
2262 Waddington, Lincolnshire (St Michael) 4 (of 5)
2264 Waithe, Lincolnshire (St Martin) 1 (of 3)
2265 Waithe, Lincolnshire (St Martin) 2 (of 3)
2266 Waithe, Lincolnshire (St Martin) 3 (of 3)
2267 Walesby, Lincolnshire (All Saints) 1 (of 3)
2268 Walesby, Lincolnshire (All Saints) 2 (of 3)
2269 Welbourne, Lincolnshire (St Chad) 2 (of 3)
2270 Well, Lincolnshire (St Margaret) 1 (of 1)
2271 Wellingore, Lincolnshire (All Saints) 3 (of 3)
2272 Welton-Le-Wold, Lincolnshire (St Martin) 1 (of 3)
2273 Welton-Le-Wold, Lincolnshire (St Martin) 2 (of 3)
2274 West Allington, Lincolnshire (The Holy Trinity) 1 (of 2)
2275 West Allington, Lincolnshire (The Holy Trinity) 2 (of 2)
2276 West Ashby, Lincolnshire (All Saints) 1 (of 3)
2277 West Ashby, Lincolnshire (All Saints) 2 (of 3)
2278 West Ashby, Lincolnshire (All Saints) 3 (of 3)
2279 West Barkwith, Lincolnshire (All Saints) 2 (of 2)
2280 West Halton, Lincolnshire (St Ethelreda) 3 (of 3)
2281 West Rasen, Lincolnshire (All Saints) 3 (of 3)
2282 Whitton, Lincolnshire (St John the Baptist) 3 (of 3)
2283 Wilsford, Lincolnshire (St Mary) 3 (of 3)
2284 Winthorpe, Lincolnshire (St Mary) 2 (of 4)
2285 Wispington, Lincolnshire (St Margaret) 1 (of 3)
2286 Wispington, Lincolnshire (St Margaret) 3 (of 3)
2287 Wragby, Lincolnshire (All Saints) 4 (of 6)
2288 Wragby, Lincolnshire (All Saints) 5 (of 6)
2289 Wrawby, Lincolnshire (St Mary) 2 (of 3)
2290 Wroot, Lincolnshire (St Pancras) 1 (of 1)
2291 Yarburgh, Lincolnshire (St John) 2 (of 3)
2292 Yarburgh, Lincolnshire (St John) 3 (of 3)
2293 Kegworth, Leicestershire (St Andrew) 4 (of 5)
2294 Brentford, Middlesex (St Lawrence) 3 (of 6)
2295 Clerkenwell, Middlesex (St James) 4 (of 4)
2296 Cranford, Middlesex (St Dunstan) 1 (of 3)
2297 Greenford, Middlesex (Holy Cross) 1 (of 3)
2298 Greenford, Middlesex (Holy Cross) 2 (of 3)
2302 Ickenham, Middlesex (St Giles) 3 (of 3)
2303 Kingsbury, Middlesex (St Andrew) 1 (of 3)
2304 London, Middlesex (All Hallows Staining) 3 (of 6)
2305 Smithfield, Middlesex (St Bartholomew the Great) 1 (of 5)
2306 Smithfield, Middlesex (St Bartholomew the Great) 2 (of 5)
2307 Smithfield, Middlesex (St Bartholomew the Great) 3 (of 5)
2308 Smithfield, Middlesex (St Bartholomew the Great) 4 (of 5)
2309 Smithfield, Middlesex (St Bartholomew the Great) 5 (of 5)
2310 Smithfield, Middlesex (St Bartholomew the Less) ? (of 3)
2311 Smithfield, Middlesex (St Bartholomew the Less) 2 (of 3)
2312 Smithfield, Middlesex (St Bartholomew the Less) ? (of 3)
2313 Twickenham, Middlesex (St Mary the Virgin) 6 (of 8)
2314 Westminster, Middlesex (St Peter) 1 (of 6)

2316 Alderton, Northamptonshire (St Margaret) 2 (of 5)
2317 Arthingworth, Northamptonshire (St Andrew) 3 (of 5)
2318 Aynhoe, Northamptonshire (St Michael) Priest's bell (of 8)
2319 Bainton, Northamptonshire (St Mary) 4 (of 4)
2320 Barnack, Northamptonshire (St John the Baptist) 5 (of 5)
2321 Barnwell St Andrew, Northamptonshire (St Andrew) 1 (of 2)
2322 Blatherwycke, Northamptonshire (The Holy Trinity) 1 (of 1)
2323 Bozeat, Northamptonshire (St Mary) 2 (of 5)
2324 Braybrooke, Northamptonshire (All Saints) 3 (of 4)
2325 Brockhall, Northamptonshire (St Peter) 1 (of 2)
2326 Canon's Ashby, Northamptonshire (St Mary) ? (of 6)
2327 Castle Ashby, Northamptonshire (St Mary Magdalene) 3 (of 5)
2328 Catesby, Northamptonshire (St Mary) 1 (of 1)
2329 Clopton, Northamptonshire (St Peter) 3 (of 5)
2330 Clopton, Northamptonshire (St Peter) 4 (of 5)
2331 Cold Ashby, Northamptonshire (St Denis) 1 (of 3)
2332 Collingtree, Northamptonshire (St Colomba) 4 (of 4)
2333 Corby, Northamptonshire (St John the Baptist) 2 (of 3)
2334 Corby, Northamptonshire (St John the Baptist) 3 (of 3)
2335 Croughton, Northamptonshire (All Saints) Priest's bell (of 3)
2336 Deene, Northamptonshire (St Peter) 4 (of 5)
2337 Desborough, Northamptonshire (St Giles) 4 (of 5)
2338 Easton-by-Stamford, Northamptonshire (All Saints) 2 (of 4)
2339 Easton Maudit, Northamptonshire (SS Peter & Paul) 4 (of 5)
2340 Easton Neston, Northamptonshire (St Mary) 2 (of 4)
2341 Edgcotte, Northamptonshire (St James) Priest's bell (of 4)
2342 Fawsley, Northamptonshire (St Mary) 1 (of 4)
2343 Fawsley, Northamptonshire (St Mary) 2 (of 4)
2344 Fawsley, Northamptonshire (St Mary) 3 (of 4)
2345 Fawsley, Northamptonshire (St Mary) 4 (of 4)
2346 Glapthorne, Northamptonshire (St Leonard) 2 (of 3)
2347 Glapthorne, Northamptonshire (St Leonard) 3 (of 3)
2348 Grafton Regis, Northamptonshire (St Mary) 3 (of 4)
2349 Grafton Regis, Northamptonshire (St Mary) 4 (of 4)
2350 Great Billing, Northamptonshire (St Andrew) 3 (of 3)
2351 Greatworth, Northamptonshire (St Peter) 3 (of 3)
2352 Grendon, Northamptonshire (St Mary) 3 (of 5)
2353 Grendon, Northamptonshire (St Mary) 5 (of 5)
2354 Hardwycke, Northamptonshire (St Leonard) ? (of 2)
2355 Harringworth, Northamptonshire (St John the Baptist) Priest's bell (of 5)
2356 Hinton-in-the-Hedges, Northamptonshire (The Holy Trinity) 1 (of 2)
2357 Hinton-in-the-Hedges, Northamptonshire (The Holy Trinity) 2 (of 2)
2358 Holcott, Northamptonshire (St Mary & All Saints) 2 (of 3)
2359 Horton, Northamptonshire (St Mary) 2 (of 3)
2360 King's Sutton, Northamptonshire (St Peter) 4 (of 8)
2361 Lilbourne, Northamptonshire (All Saints) 2 (of 4)
2362 Lilbourne, Northamptonshire (All Saints) 3 (of 4)
2363 Lois Weedon, Northamptonshire (St Mary) 1 (of 3)
2364 Maidwell, Northamptonshire (St Mary) 4 (of 4)
2365 Marston St Lawrence, Northamptonshire (St Lawrence) 2 (of 5)
2366 Marston St Lawrence, Northamptonshire (St Lawrence) 3 (of 5)
2367 Moulton, Northamptonshire (SS Peter & Paul) 5 (of 5)
2368 Newton Bromswold, Northamptonshire (St Peter) 2 (of 3)
2369 Northborough, Northamptonshire (St Andrew) 2 (of 2)
2370 Old, Northamptonshire (St Andrew) 4 (of 5)
2371 Passenham, Northamptonshire (St Guthlac) 1 (of 5)
2372 Pattishall, Northamptonshire (Holy Cross) 5 (of 5)
2373 Paulerspury, Northamptonshire (St James) 1 (of 5)
2374 Peterborough, Northamptonshire (St Peter) ? (of ?)
2375 Pilton, Northamptonshire (St Mary) 4 (of 4)
2376 Potterspury, Northamptonshire (St Nicholas) 2 (of 5)

2377 Potterspury, Northamptonshire (St Nicholas) 4 (of 5)
2378 Radston, Northamptonshire (St Lawrence) 1 (of 2)
2379 Radston, Northamptonshire (St Lawrence) 2 (of 2)
2380 Roade, Northamptonshire (St Mary) 2 (of 4)
2381 Roade, Northamptonshire (St Mary) 3 (of 4)
2382 Roade, Northamptonshire (St Mary) 4 (of 4)
2383 Roade, Northamptonshire (St Mary) 1 (of 4)
2384 Slapton, Northamptonshire (St Botolph) 1 (of 2)
2385 Slapton, Northamptonshire (St Botolph) 2 (of 2)
2386 Slapton, Northamptonshire (St Botolph) Priest's bell (of 2)
2387 Stamford Baron, Northamptonshire (St Martin) 1 (of 3)
2388 Stamford Baron, Northamptonshire (St Martin) 2 (of 3)
2389 Stamford Baron, Northamptonshire (St Martin) 3 (of 3)
2390 Stanion, Northamptonshire (St Peter) 4 (of 4)
2391 Stanwick, Northamptonshire (St Lawrence) 1 (of 3)
2392 Stowe-Nine-Churches, Northamptonshire (St Michael) 4 (of 4)
2393 Sudborough, Northamptonshire (All Saints) 2 (of 4)
2394 Tansor, Northamptonshire (St Mary) 3 (of 3)
2395 Thrapstone, Northamptonshire (St James) 4 (of 5)
2396 Twywell, Northamptonshire (St Nicholas) 2 (of 3)
2397 Twywell, Northamptonshire (St Nicholas) 3 (of 3)
2398 Ufford, Northamptonshire (St Andrew) 2 (of 3)
2399 Ufford, Northamptonshire (St Andrew) 3 (of 3)
2400 Wadenhoe, Northamptonshire (St Michael) 2 (of 3)
2401 Walgrave, Northamptonshire (St Peter) Priest's bell (of 5)
2402 Wansford, Northamptonshire (St Mary) 2 (of 2)
2403 Werrington, Northamptonshire (St John the Baptist) 1 (of 2)
2404 Werrington, Northamptonshire (St John the Baptist) 2 (of 2)
2405 Wittering, Northamptonshire (All Saints) 2 (of 3)
2406 Wilby, Northamptonshire (St Mary the Virgin) 3 (of 3)
2407 Winwick, Northamptonshire (St Michael) 2 (of 3)
2408 Winwick, Northamptonshire (St Michael) 3 (of 3)
2409 Yarwell, Northamptonshire (St Mary Magdalene) 1 (of 3)
2410 Alnwick, Northumberland (St Michael) 1 (of 3)
2411 Alnwick, Northumberland (St Michael) 2 (of 3)
2412 Bywell, Northumberland (St Andrew) 1 (of 2)
2413 Bywell, Northumberland (St Andrew) 2 (of 2)
2414 Bywell, Northumberland (St Peter) 1 (of 2)
2415 Bywell, Northumberland (St Peter) 2 (of 2)
2416 Delaval, Northumberland (Our Lady) 1 (of 1)
2417 Eglingham, Northumberland (St Maurice) 1 (of 2)
2418 Eglingham, Northumberland (St Maurice) 2 (of 2)
2419 Felton, Northumberland (St Michael) 2 (of 2)
2420 Hartburn, Northumberland (unknown) 1 (of 2)
2421 Hartburn, Northumberland (unknown) 2 (of 2)
2422 Hexham, Northumberland (St Andrew) 4 (of 6)
2423 Hexham, Northumberland (St Andrew) 5 (of 6)
2424 Hexham, Northumberland (St Andrew) 6 (of 6)
2425 Ilderton, Northumberland (St Michael) 1 (of 1)
2426 Kirkwhelpingham, Northumberland (St Bartholomew) 1 (of 2)
2427 Kirkwhelpingham, Northumberland (St Bartholomew) 2 (of 2)
2428 Mitford, Northumberland (St Mary Magdalene) Disused (of 8)
2430 Newburn, Northumberland (St Michael & All Angels) 3 (of 3)
2431 Newcastle-Upon-Tyne, Northumberland (St Nicholas) 1 (of 5)
2432 Newcastle-Upon-Tyne, Northumberland (St Nicholas) 4 (of 5)
2433 Newcastle-Upon-Tyne, Northumberland (St Nicholas) 3 (of 5)
2434 Ovingham, Northumberland (St Mary) 1 (of 3)
2435 Ovingham, Northumberland (St Mary) 2 (of 3)
2436 Ponteland, Northumberland (St Mary) 1 (of 2)
2437 Whittingham, Northumberland (St Bartholomew) 1 (of 2)
2438 Woodhorn, Northumberland (St Mary) 1 (of 2)
2439 Woodhorn, Northumberland (St Mary) 2 (of 2)

2440 Warkworth, Northumberland (St Lawrence) 1 (of 2)
2441 Warkworth, Northumberland (St Lawrence) 2 (of 2)
2442 Askham, Nottinghamshire (St Nicholas) 1 (of 3)
2443 Attenborough, Nottinghamshire (St Mary the Virgin) 5 (of 5)
2444 Basford, Nottinghamshire (St Leodegarius) 2 (of 3)
2445 Beckingham, Nottinghamshire (All Saints) ? (of ?)
2446 Beeston, Nottinghamshire (St John the Baptist) 3 (of 3)
2447 Bole, Nottinghamshire (St Martin) 1 (of ?)
2449 Bulcote, Nottinghamshire (The Holy Trinity) 1 (of 1)
2450 Bunney, Nottinghamshire (St Mary the Virgin) 6 (of 6)
2451 Burton Joyce, Nottinghamshire (St Helen) 1 (of 3)
2452 Car Colston, Nottinghamshire (St Mary) 4 (of 4)
2453 Carlton In Lindrick, Nottinghamshire (St John the Evangelist) 1 (of 3)
2454 Clarborough, Nottinghamshire (St John the Baptist) 1 (of 3)
2455 Colston-Basset, Nottinghamshire (St Mary) 3 (of 5)
2456 Cossall, Nottinghamshire (St Katherine) 1 (of 2)
2457 Cotgrave, Nottinghamshire (All Saints) 5 (of 5)
2458 Cromwell, Nottinghamshire (St Giles) 1 (of 3)
2459 Cropwell Bishop, Nottinghamshire (St Giles) 3 (of 4)
2460 East Markham, Nottinghamshire (St John the Baptist) Sanctus bell (of 8)
2461 Edingley, Nottinghamshire (St Giles) 1 (of 2)
2462 Elkesley, Nottinghamshire (St Giles) 1 (of 3)
2463 Elkesley, Nottinghamshire (St Giles) 2 (of 3)
2464 Elkesley, Nottinghamshire (St Giles) 3 (of 3)
2466 Flawborough, Nottinghamshire (St Peter) 1 (of 2)
2467 Flawborough, Nottinghamshire (St Peter) 2 (of 2)
2468 Fledborough, Nottinghamshire (St Gregory) 1 (of 2)
2469 Granby, Nottinghamshire (All Saints) 2 (of 5)
2470 Granby, Nottinghamshire (All Saints) 3 (of 5)
2471 Greasley, Nottinghamshire (St Mary) 3 (of 5)
2472 Gringley, Nottinghamshire (SS Peter & Paul) 2 (of 4)
2473 Halam, Nottinghamshire (St Michael) 1 (of 2)
2474 Hawton, Nottinghamshire (All Saints) 2 (of 4)
2475 Headon Cum Upton, Nottinghamshire (St Peter) 1 (of 2)
2476 Hucknall Torkard, Nottinghamshire (St Mary Magdalene) 1 (of 3)
2477 Langford, Nottinghamshire (St Bartholomew) ? (of 2)
2478 Radcliffe On Trent, Nottinghamshire (St Mary) 2 (of 4)
2479 Kirklington, Nottinghamshire (St Swithin) 1 (of 3)
2480 Laxton, Nottinghamshire (St Michael) 2 (of 3)
2481 Littleborough, Nottinghamshire (St Nicholas) 1 (of 2)
2482 Littleborough, Nottinghamshire (St Nicholas) 2 (of 2)
2483 Lowdham, Nottinghamshire (St Mary the Virgin) 3 (of ?)
2484 Mansfield Woodhouse, Nottinghamshire (St Edmund the King) 3 (of 4)
2485 Maplebeck, Nottinghamshire (St Radegund) 2 (of 3)
2486 Marnham, Nottinghamshire (St Wilfrid) 2 (of 3)
2487 Mattersey, Nottinghamshire (All Saints) 1 (of 3)
2488 Mattersey, Nottinghamshire (All Saints) 2 (of 3)
2489 Misterton, Nottinghamshire (All Saints) 1 (of 3)
2491 Morton, Nottinghamshire (St Denis) 2 (of 2)
2492 Normanton-on-Trent, Nottinghamshire (St Matthew) 1 (of 3)
2493 Normanton-on-Trent, Nottinghamshire (St Matthew) 3 (of 3)
2494 Nottingham, Nottinghamshire (St Mary the Virgin) Priest's bell (of 12)
2495 Owthorpe, Nottinghamshire (St Margaret) 1 (of 1)
2496 Papplewick, Nottinghamshire (St James) 2 (of 3)
2497 Radford, Nottinghamshire (St Peter) 2 (of 2)
2498 Rolleston, Nottinghamshire (The Holy Trinity) 3 (of 4)
2499 Ruddington, Nottinghamshire (St Peter) 1 (of 6)
2500 Ruddington, Nottinghamshire (St Peter) 4 (of 6)
2501 Saundby, Nottinghamshire (St Martin) 4 (of 4)
2502 Scarrington, Nottinghamshire (St John of Beverley) 1 (of 3)
2503 Scarrington, Nottinghamshire (St John of Beverley) 2 (of 3)

2504 Scarrington, Nottinghamshire (St John of Beverley) 3 (of 3)
2505 Screveton, Nottinghamshire (St Wilfrid) 2 (of 3)
2506 Selston, Nottinghamshire (St Helen With St Michael & All Angels) 1 (of 3)
2507 Shelford, Nottinghamshire (SS Peter & Paul) 2 (of 5)
2508 Shelford, Nottinghamshire (SS Peter & Paul) 5 (of 5)
2509 Sneinton, Nottinghamshire (St Stephen) 1 (of 3)
2510 South Muskham, Nottinghamshire (St Wilfrid) 2 (of 3)
2511 Stanford-on-Soar, Nottinghamshire (St John the Baptist) 3 (of 4)
2512 Stapleford, Nottinghamshire (St Helen) 2 (of 3)
2513 Stapleford, Nottinghamshire (St Helen) 3 (of 3)
2514 Stokeham, Nottinghamshire (St Peter) 1 (of 1)
2515 Strelley, Nottinghamshire (All Saints) 1 (of 1)
2516 Sutton Bonnington, Nottinghamshire (St Anne) 1 (of 2)
2517 Sutton Cum Lound, Nottinghamshire (St Bartholomew) 1 (of 3)
2520 Thorpe by Newark, Nottinghamshire (St Lawrence) 1 (of 2)
2521 Thorpe by Newark, Nottinghamshire (St Lawrence) 2 (of 2)
2522 Thrumpton, Nottinghamshire (All Saints) 4 (of 5)
2523 Tresswell, Nottinghamshire (St John the Baptist) 2 (of 3)
2524 Tresswell, Nottinghamshire (St John the Baptist) 3 (of 3)
2525 South Wheatley, Nottinghamshire (St Helen) 1 (of 3)
2526 West Bridgeford, Nottinghamshire (St Giles) 1 (of 3)
2527 West Bridgeford, Nottinghamshire (St Giles) 2 (of 3)
2528 West Markham, Nottinghamshire (All Saints) 1 (of 1)
2529 Weston, Nottinghamshire (All Saints) 2 (of 3)
2530 Whatton-in-the-Vale, Nottinghamshire (St John of Beverley) Sanctus bell (of 5)
2531 Wysall, Nottinghamshire (The Holy Trinity) 1 (of 3)
2532 Adwell, Oxfordshire (St Mary) 1 (of 2)
2533 Alkerton, Oxfordshire (St Michael) 4 (of 4)
2534 Ambrosden, Oxfordshire (St Mary the Virgin) Sanctus bell (of 8)
2535 Asthall, Oxfordshire (St Nicholas) 2 (of 3)
2536 Asthall, Oxfordshire (St Nicholas) 3 (of 3)
2537 Aston Rowant, Oxfordshire (SS Peter & Paul) 1 (of 6)
2538 Aston Rowant, Oxfordshire (SS Peter & Paul) 5 (of 6)
2539 Bladon, Oxfordshire (St Martin) 2 (of 3)
2540 Bloxham, Oxfordshire (St Mary) 5 (of 6)
2541 Bloxham, Oxfordshire (St Mary) Sanctus bell (of 6)
2542 Brightwell Baldwin, Oxfordshire (St Bartholomew) 2 (of 3)
2543 Brightwell Baldwin, Oxfordshire (St Bartholomew) 3 (of 3)
2544 Brightwell Baldwin, Oxfordshire (St Bartholomew) Sanctus bell (of 3)
2545 Britwell Salome, Oxfordshire (St Nicholas) 2 (of 2)
2546 Brize Norton, Oxfordshire (St Britius) 4 (of 6)
2547 Broadwell, Oxfordshire (SS Peter & Paul) 2 (of 5)
2548 Broadwell, Oxfordshire (SS Peter & Paul) 5 (of 5)
2549 Broughton Pogis, Oxfordshire (St Peter) 1 (of 1)
2550 Burford, Oxfordshire (St John the Baptist) 8 (of 8)
2551 Caversfield, Oxfordshire (St Lawrence) 1 (of 2)
2552 Caversfield, Oxfordshire (St Lawrence) 2 (of 2)
2553 Charlbury, Oxfordshire (St Mary the Virgin) Sanctus bell (of 6)
2554 Dorchester, Oxfordshire (SS Peter & Paul) 7 (of 8)
2555 Dorchester, Oxfordshire (SS Peter & Paul) 8 (of 8)
2556 Drayton-St-Leonard, Oxfordshire (St Leonard) 3 (of 3)
2557 Elsfield, Oxfordshire (St Thomas of Canterbury) 1 (of 2)
2558 Ewelme, Oxfordshire (St Mary) 2 (of 5)
2559 Fifield, Oxfordshire (St John the Baptist) 2 (of 3)
2560 Fifield, Oxfordshire (St John the Baptist) Sanctus bell (of 3)
2561 Finmere, Oxfordshire (St Michael) 1 (of 3)
2562 Finmere, Oxfordshire (St Michael) 3 (of 3)
2563 Goring, Oxfordshire (St Thomas of Canterbury) 3 (of 5)
2564 Goring, Oxfordshire (St Thomas of Canterbury) 4 (of 5)
2565 Hampton Gay, Oxfordshire (St Giles) 1 (of 2)
2566 Hardwick, Oxfordshire (St Mary) 1 (of 1)
2567 Harpsden, Oxfordshire (St Margaret) 2 (of 2)
2568 Headington, Oxfordshire (St Andrew) 5 (of 6)

2569 Holton, Oxfordshire (St Bartholomew) 2 (of 3)
2570 Idbury, Oxfordshire (St Nicholas) 2 (of 3)
2571 Idbury, Oxfordshire (St Nicholas) 3 (of 3)
2572 Idbury, Oxfordshire (St Nicholas) Sanctus bell (of 3)
2573 Kelmscot, Oxfordshire (St George) 1 (of 2)
2574 Kencot, Oxfordshire (St George) 1 (of 3)
2575 Kencot, Oxfordshire (St George) 3 (of 3)
2576 Kiddington, Oxfordshire (St Nicholas) Sanctus bell (of 3)
2577 Marsh Baldon, Oxfordshire (St Peter) 3 (of 4)
2578 Minster Lovell, Oxfordshire (St Kenelm) Sanctus bell (of 3)
2579 Newington, Oxfordshire (St Giles) 2 (of 4)
2580 Newton Purcell, Oxfordshire (St Michael) 1 (of 2)
2581 Newton Purcell, Oxfordshire (St Michael) 2 (of 2)
2582 North Leigh, Oxfordshire (St Mary) Sanctus bell (of 6)
2583 Nuffield, Oxfordshire (The Holy Trinity) 1 (of 2)
2584 Nuffield, Oxfordshire (The Holy Trinity) 2 (of 2)
2588 Oxford, Oxfordshire (St Aldate) 5 (of 5)
2589 Oxford, Oxfordshire (St Clement) 1 (of 2)
2590 Oxford, Oxfordshire (St Ebbe) 2 (of 3)
2591 Oxford, Oxfordshire (St Giles) 3 (of 4)
2592 Oxford, Oxfordshire (St Martin) Sanctus bell (of 6)
2593 Oxford, Oxfordshire (Christchurch) 3 (of 6)
2594 Oxford, Oxfordshire (Christchurch) 4 (of 6)
2595 Oxford, Oxfordshire (Christchurch) 5 (of 6)
2596 Oxford, Oxfordshire (Christchurch) Litany bell (of 6)
2597 Over Worton, Oxfordshire (The Holy Trinity) 2 (of 2)
2598 Rotherfield Peppard, Oxfordshire (All Saints) 1 (of 3)
2599 Rotherfield Peppard, Oxfordshire (All Saints) 2 (of 3)
2600 Sandford-on-Thames, Oxfordshire (St Andrew) 3 (of 3)
2601 Shifford, Oxfordshire (St Mary) 1 (of 2)
2602 Shipton-on-Cherwell, Oxfordshire (Holy Cross) 1 (of 2)
2603 Shipton-on-Cherwell, Oxfordshire (Holy Cross) 2 (of 2)
2604 Souldern, Oxfordshire (St Mary) 4 (of 6)
2605 South Leigh, Oxfordshire (St James the Great) Sanctus bell (of 8)
2606 Stoke Talmage, Oxfordshire (St James) 1 (of 2)
2607 Stoke Talmage, Oxfordshire (St James) 2 (of 2)
2608 Stonesfield, Oxfordshire (St James the Lesser) 4 (of 5)
2609 Swyncombe, Oxfordshire (St Botolph) 2 (of 2)
2610 Swyncombe, Oxfordshire (St Botolph) 1 (of 2)
2611 Waterperry, Oxfordshire (St Mary) 2 (of 2)
2612 Waterstock, Oxfordshire (St Leonard) 3 (of 3)
2613 Wendlebury, Oxfordshire (St Giles) 3 (of 3)
2614 Westcote Barton, Oxfordshire (St Edward the Confessor) 2 (of 3)
2615 Westcote Barton, Oxfordshire (St Edward the Confessor) 3 (of 3)
2616 Westcote Barton, Oxfordshire (St Edward the Confessor) Sanctus bell (of 3)
2617 Weston-on-the-Green, Oxfordshire (St Mary) 2 (of 3)
2618 Weston-on-the-Green, Oxfordshire (St Mary) 3 (of 3)
2619 Wigginton, Oxfordshire (St Giles) 3 (of 3)
2620 Ayston, Rutland (St Mary) 2 (of 3)
2621 Barrowden, Rutland (St Peter) 4 (of 5)
2622 Hambleton, Rutland (St Andrew) 3 (of 4)
2623 Langham, Rutland (SS Peter & Paul) 4 (of 6)
2624 North Luffenham, Rutland (St John the Baptist) 2 (of 5)
2625 Preston, Rutland (SS Peter & Paul) 1 (of 3)
2626 Preston, Rutland (SS Peter & Paul) Sanctus bell (of 3)
2627 Ridlington, Rutland (SS Mary & Andrew) 1 (of 3)
2628 South Luffenham, Rutland (St Mary) 4 (of 4)
2629 Teigh, Rutland (The Holy Trinity) 3 (of 3)
2630 Tickencote, Rutland (St Peter) 1 (of 2)
2631 Tixover, Rutland (St Luke) 1 (of 1)
2632 Whitwell, Rutland (St Michael) 2 (of 2)
2633 Wing, Rutland (SS Peter & Paul) 4 (of 5)
2634 Acton Round, Shropshire (St Mary) 1 (of 2)
2635 Acton Round, Shropshire (St Mary) 2 (of 2)
2636 Acton Scott, Shropshire (St Margaret) 1 (of 3)
2637 Acton Scott, Shropshire (St Margaret) 2 (of 3)
2638 Acton Scott, Shropshire (St Margaret) 3 (of 3)
2639 Adderley, Shropshire (St Peter) 2 (of 3)
2640 Ashford Carbonell, Shropshire (St Mary) 1 (of 3)
2641 Ashford Carbonell, Shropshire (St Mary) 2 (of 3)
2642 Astley, Shropshire (St Mary) 1 (of 1)
2643 Astley Abbots, Shropshire (St Calixtus) 1 (of 3)
2644 Astley Abbots, Shropshire (St Calixtus) 2 (of 3)
2645 Aston Eyre, Shropshire (unknown) 1 (of 2)
2646 Aston Eyre, Shropshire (unknown) 2 (of 2)
2647 Barrow, Shropshire (St Giles) 1 (of 2)

2648 Baschurch, Shropshire (All Saints) 1 (of 4)
2649 Baschurch, Shropshire (All Saints) 2 (of 4)
2650 Bedstone, Shropshire (St Mary) 2 (of 2)
2651 Berrington, Shropshire (All Saints) 4 (of 5)
2652 Billingsley, Shropshire (St Mary) 1 (of 2)
2653 Bitterley, Shropshire (St Mary) 1 (of 3)
2654 Bitterley, Shropshire (St Mary) 2 (of 3)
2655 Bitterley, Shropshire (St Mary) 3 (of 3)
2656 Broughton, Shropshire (St Mary) 1 (of 2)
2657 Burwarton, Shropshire (St Lawrence) ? (of 2)
2658 Church Aston, Shropshire (St Andrew) 1 (of 3)
2659 Church Preen, Shropshire (St John the Baptist) 1 (of 2)
2660 Cold Weston, Shropshire (St Mary) 1 (of 1)
2661 Condover, Shropshire (St Andrew) 4 (of 6)
2662 Clungunford, Shropshire (St Cuthbert) 2 (of 3)
2663 Clungunford, Shropshire (St Cuthbert) 3 (of 3)
2664 Ditton Priors, Shropshire (St John the Baptist) 1 (of 4)
2665 Ditton Priors, Shropshire (St John the Baptist) 2 (of 4)
2666 Eaton-Under-Heywood, Shropshire (St Edith) 2? (of 3)
2667 Fitz, Shropshire (SS Peter & Paul) Call bell (of ?)
2668 Ford, Shropshire (St Michael) 2 (of 2)
2669 Ford, Shropshire (St Michael) 1 (of 2)
2670 Frodesley, Shropshire (St Mark) 1 (of 2)
2671 Frodesley, Shropshire (St Mark) 2 (of 2)
2672 Habberley, Shropshire (St Mary) 1 (of 2)
2673 Halford, Shropshire (St Thomas) 2 (of 2)
2674 Harley, Shropshire (St Mary) 1 (of 3)
2675 Harley, Shropshire (St Mary) 2 (of 3)
2676 Harley, Shropshire (St Mary) 3 (of 3)
2677 Highley, Shropshire (St Mary) 3 (of 4)
2678 Highley, Shropshire (St Mary) 4 (of 4)
2679 Highley, Shropshire (St Mary) 2 (of 4)
2680 Hope Bowdler, Shropshire (St Andrew) 1 (of 4)
2681 Hopton Castle, Shropshire (St Mary) 1 (of 2)
2682 Hopton Wafers, Shropshire (St Michael) Sanctus bell (of 2)
2683 Hordley, Shropshire (St Mary the Virgin) 1 (of 2)
2684 Kinlet, Shropshire (St John the Baptist) Sanctus bell (of 6)
2685 Lee Brockhurst, Shropshire (St Peter) 1 (of 2)
2686 Longden, Shropshire (St Ruthen) 1 (of 1)
2687 Longford, Shropshire (St Mary) 1 (of 3)
2688 Longnor, Shropshire (St Mary) 1 (of 2)
2689 Long Stanton, Shropshire (St Michael) 3 (of 3)
2690 Loughton, Shropshire (unknown) 1 (of 1)
2691 Lydham, Shropshire (The Holy Trinity) 1 (of 2)
2692 Middleton Scriven, Shropshire (St John the Baptist) 1 (of 2)
2693 Milson, Shropshire (St George) 1 (of 3)
2694 Mindtown, Shropshire (St John the Baptist) 1 (of 2)
2695 Mindtown, Shropshire (St John the Baptist) 2 (of 2)
2696 Monk Hopton, Shropshire (St Peter) 2 (of 2)
2697 Munslow, Shropshire (St Michael) 3 (of 4)
2698 Myddle, Shropshire (St Peter) 2 (of 3)
2699 Neen Sollars, Shropshire (All Saints) 1 (of 3)
2700 Ness Magna, Shropshire (St Andrew) 1 (of 3)
2701 Ness Parva, Shropshire (St Martin) 1 (of 1)
2702 Oldbury, Shropshire (St Nicholas) 1 (of 1)
2703 Onibury, Shropshire (St Michael) 2 (of 4)
2704 Onibury, Shropshire (St Michael) 3 (of 4)
2705 Ratlingshope, Shropshire (St Margaret) 1 (of 2)
2706 Ratlingshope, Shropshire (St Margaret) 2 (of 2)
2707 Rodington, Shropshire (St George) 1 (of 2)
2708 Rodington, Shropshire (St George) 2 (of 2)
2709 Shineton, Shropshire (SS Peter & Paul) 1 (of 3)
2710 Shrawardine, Shropshire (St Mary) 1 (of 2)
2711 Shrawardine, Shropshire (St Mary) 2 (of 2)
2712 Shrewsbury, Shropshire (Holy Cross) 5 (of 5)
2713 Stanton-on-Hine-Heath, Shropshire (St Andrew) 2 (of 4)
2714 Stirchley, Shropshire (St James) 1 (of 3)
2715 Stowe, Shropshire (St Michael) 1 (of 3)
2716 Stowe, Shropshire (St Michael) 2 (of 3)
2717 Tasley, Shropshire (SS Peter & Paul) 1 (of 2)
2718 Tong, Shropshire (St Bartholomew) Great bell (of 6)
2719 Uffington, Shropshire (The Holy Trinity) 2 (of 2)
2720 Upton Cressett, Shropshire (St Michael) 2 (of 2)
2721 Upton Magna, Shropshire (St Lucy?) 1 (of 4)
2722 Welsh Frankton, Shropshire (St Andrew) 1 (of 1)
2724 Withington, Shropshire (St John) 1 (of 2)
2725 Withington, Shropshire (St John) 2 (of 2)
2726 Wrockwardine, Shropshire (St Peter) 3 (of 6)
2727 Wrockwardine, Shropshire (St Peter) 6 (of 6)
2729 Angersleigh, Somerset (St Michael) 1 (of 4)
2730 Angersleigh, Somerset (St Michael) 3 (of 4)
2731 Angersleigh, Somerset (St Michael) 4 (of 4)
2732 Ansford, Somerset (St Andrew) 1 (of 4)

2733 Babcary, Somerset (Holy Cross) 3 (of 5)
2734 Backwell, Somerset (St Andrew) 2 (of 6)
2735 Backwell, Somerset (St Andrew) 5 (of 6)
2736 Badgworth, Somerset (St Congar) 2 (of 5)
2737 Badgworth, Somerset (St Congar) 3 (of 5)
2738 Banwell, Somerset (St Andrew) Sanctus bell (of 6)
2739 Barwick, Somerset (St Mary Magdalene) 1 (of 2)
2740 Barwick, Somerset (St Mary Magdalene) 2 (of 2)
2742 Bath, Somerset (St Matthew) 4 (of 6)
2743 Bathampton, Somerset (St Michael) 3 (of 5)
2744 Bathampton, Somerset (St Michael) 5 (of 5)
2745 Batheaston, Somerset (St John the Baptist) 4 (of 6)
2746 Bawdrip, Somerset (St Michael) 1 (of 4)
2747 Bawdrip, Somerset (St Michael) 4 (of 4)
2748 Bicknoller, Somerset (St George) 4 (of 4)
2749 Bishop's Hull, Somerset (St Peter) 3 (of 5)
2750 Bradford, Somerset (St Giles) 1 (of 5)
2751 Bradford, Somerset (St Giles) 2 (of 5)
2752 Bradford, Somerset (St Giles) 3 (of 5)
2753 Bradford, Somerset (St Giles) 5 (of 5)
2754 Bratton St Maur, Somerset (St Nicholas) 3 (of 3)
2755 Brean, Somerset (St Bridget) 1 (of 3)
2756 Brean, Somerset (St Bridget) 2 (of 3)
2757 Brean, Somerset (St Bridget) 3 (of 3)
2758 Brockley, Somerset (St Nicholas) 2 (of 2)
2759 Brompton Ralph, Somerset (St Mary) 2 (of 4)
2760 Brompton Ralph, Somerset (St Mary) 4 (of 4)
2761 Bruton, Somerset (St Mary) 1 (of ?)
2762 Bruton, Somerset (St Mary) ? (of ?)
2763 Brimpton, Somerset (St Andrew) 1 (of 2)
2764 Buckland Dinham, Somerset (St Michael) 5 (of 6)
2765 Burrington, Somerset (The Holy Trinity) 6 (of 6)
2766 Butcombe, Somerset (St Michael) 1 (of 3)
2767 Butcombe, Somerset (St Michael) 2 (of 3)
2768 Butcombe, Somerset (St Michael) 3 (of 3)
2769 Cameley, Somerset (St James) 2 (of 5)
2770 Cameley, Somerset (St James) 5 (of 5)
2771 Chaffcombe, Somerset (St Michael) 2 (of 3)
2772 Charlton Adam, Somerset (SS Peter & Paul) 3 (of 5)
2773 Charlton Canfield, Somerset (SS Peter & Paul) 1 (of 4)
2774 Charlton Canfield, Somerset (SS Peter & Paul) 3 (of 4)
2775 Hornblotton, Somerset (St Peter) 1 (of 3)
2776 Charlton Musgrove, Somerset (St Stephen) 1 (of 3)
2777 Charlton Musgrove, Somerset (St Stephen) 3 (of 3)
2778 Charlton Queen, Somerset (St Margaret) 2 (of 4)
2779 Charlton Queen, Somerset (St Margaret) 3 (of 4)
2780 Charlynch, Somerset (St Mary) 2 (of 4)
2781 Charlynch, Somerset (St Mary) 3 (of 4)
2782 Charter House Hinton, Somerset (St John the Baptist) 2 (of 3)
2783 Cheddar, Somerset (St Andrew) 2 (of 5)
2784 Chedzoy, Somerset (St Mary) 3 (of 5)
2785 Chilthorne Domer, Somerset (St Mary) 1 (of 2)
2786 Chiselborough, Somerset (St Michael) 1 (of 4)
2787 Chiselborough, Somerset (St Michael) 2 (of 4)
2788 Chiselborough, Somerset (St Michael) 3 (of 4)
2789 Abbot's Bromley, Staffordshire (St Nicholas) 5 (of 5)
2790 Christon, Somerset (Blessed Virgin Mary) 2 (of ?)
2791 Churchill, Somerset (St John the Baptist) 3 (of 5)
2792 Clapton In Gordano, Somerset (St Michael) 1 (of 3)
2793 Clapton In Gordano, Somerset (St Michael) 2 (of 3)
2794 Clapton In Gordano, Somerset (St Michael) Sanctus bell (of 3)
2795 Closworth, Somerset (All Saints) 2 (of 5)
2796 Combe Flory, Somerset (SS Peter & Paul) 3 (of 5)
2797 Combe Hay, Somerset (unknown) 3 (of 4)
2798 Combe St Nicholas, Somerset (St Nicholas) 4 (of 5)
2799 Compton Dando, Somerset (St Mary) 3 (of 5)
2800 Compton Paunceford, Somerset (St Mary) 2 (of 3)
2801 Compton Paunceford, Somerset (St Mary) 3 (of 3)
2802 Corfe, Somerset (St Nicholas) 2 (of 4)
2803 Corfe, Somerset (St Nicholas) 3 (of 3)
2804 Corfe, Somerset (St Nicholas) 4 (of 4)
2805 Cossington, Somerset (St Mary) 2 (of 5)
2806 Crowcombe, Somerset (The Holy Ghost) 3 (of 5)
2807 Crowcombe, Somerset (The Holy Ghost) 4 (of 5)
2808 Culbone, Somerset (St Beuno) 1 (of 2)
2810 Curry Mallet, Somerset (St James) 4 (of 5)
2811 Curry Mallet, Somerset (St James) 5 (of 5)
2812 Curry Rivel, Somerset (St Andrew) 1 (of 5)
2813 Dinder, Somerset (All Saints) 1 (of 5)
2814 Dinder, Somerset (All Saints) 2 (of 5)
2815 Dinder, Somerset (All Saints) ? (of 5)
2816 Ditcheat, Somerset (St Mary Magdalene) 5 (of 6)

2817 Ditcheat, Somerset (St Mary Magdalene) 6 (of 6)
2818 Doulting, Somerset (St Aldhelm) 2 (of 6)
2819 Dowlish Wake, Somerset (St Andrew) 2 (of 4)
2820 Dowlish Wake, Somerset (St Andrew) 4 (of 4)
2821 Dulverton, Somerset (All Saints) 4 (of 5)
2824 East Brent, Somerset (St Mary) 2 (of 5)
2825 East Brent, Somerset (St Mary) 3 (of 5)
2826 East Chinnock, Somerset (St Mary) 2 (of 5)
2827 East Harptree, Somerset (St Lawrence) 3 (of 5)
2828 East Quantoxhead, Somerset (St Mary) 2 (of 4)
2829 East Quantoxhead, Somerset (St Mary) 4 (of 4)
2830 Elworthy, Somerset (St Martin) 1 (of 4)
2831 Elworthy, Somerset (St Martin) 4 (of 4)
2832 Emborough, Somerset (St Mary) 1 (of 2)
2833 Emborough, Somerset (St Mary) 2 (of 2)
2834 Evercreech, Somerset (St Peter) 5 (of 6)
2835 Exton, Somerset (St Peter) 3 (of 4)
2836 Farrington Gurney, Somerset (St John the Baptist) 1 (of 3)
2837 Fiddington, Somerset (St Martin) 1 (of 4)
2838 Fivehead, Somerset (St Martin) 1 (of 5)
2839 Fivehead, Somerset (St Martin) 2 (of 5)
2840 Fivehead, Somerset (St Martin) 4 (of 5)
2841 Foxcote, Somerset (St James the Lesser) ? (of ?)
2842 Great Elm, Somerset (St Mary) 1 (of 3)
2843 Great Elm, Somerset (St Mary) 2 (of 3)
2844 Great Elm, Somerset (St Mary) 3 (of 3)
2845 Greinton, Somerset (St Michael) 1 (of 4)
2846 Halse, Somerset (St James) 2 (of 5)
2847 Halse, Somerset (St James) 3 (of 5)
2848 Hatch Beauchamp, Somerset (St John the Baptist) 3 (of 4)
2849 Hawkridge, Somerset (St Giles) 2 (of 3)
2850 Hawkridge, Somerset (St Giles) 3 (of 3)
2851 Hemington, Somerset (St Mary) 2 (of 5)
2852 Hemington, Somerset (St Mary) 4 (of 5)
2853 High Littleton, Somerset (The Holy Trinity) 2 (of 3)
2854 Hill Farrance, Somerset (Holy Cross) 4 (of 5)
2855 Holcombe, Somerset (St Andrew) 1 (of 2)
2856 Holcombe, Somerset (St Andrew) 2 (of 2)
2857 Holford, Somerset (St Mary) 1 (of 3)
2858 Holford, Somerset (St Mary) 2 (of 3)
2859 Holton, Somerset (St Nicholas) 1 (of 3)
2860 Holton, Somerset (St Nicholas) 2 (of 3)
2861 Holton, Somerset (St Nicholas) 3 (of 3)
2862 Hornblotton, Somerset (St Peter) 3 (of 3)
2863 Horsington, Somerset (St John the Baptist) 5 (of 5)
2864 Huish Champflower, Somerset (St Peter) 3 (of 5)
2865 Ile Abbots, Somerset (St Mary) 2 (of 5)
2866 Ile Abbots, Somerset (St Mary) 3 (of 5)
2867 Ile Brewers, Somerset (All Saints) 1 (of 4)
2868 Ile Brewers, Somerset (All Saints) 2 (of 4)
2871 Keynsham, Somerset (St John the Baptist) Sanctus bell (of 8)
2872 Kilton, Somerset (St Nicholas) 1 (of 4)
2873 Kilve, Somerset (St Mary) 3 (of 3)
2874 Kingsbury Episcopi, Somerset (St Martin) 1 (of 5)
2875 Kingsdon, Somerset (All Saints) 1 (of 5)
2876 Kingsdon, Somerset (All Saints) 3 (of 5)
2877 Kingston, Somerset (St Mary) 3 (of 6)
2878 Kingston, Somerset (St Mary) 4 (of 6)
2879 Kittesford, Somerset (St Nicholas) 1 (of 3)
2880 Kittesford, Somerset (St Nicholas) 2 (of 3)
2881 Kittesford, Somerset (St Nicholas) 3 (of 3)
2882 Lamyatt, Somerset (SS Mary & John) 2 (of 3)
2883 Lamyatt, Somerset (SS Mary & John) 3 (of 3)
2884 Langridge, Somerset (St Mary Magdalene) 2 (of 3)
2885 Langridge, Somerset (St Mary Magdalene) 1 (of 3)
2886 Langridge, Somerset (St Mary Magdalene) 3 (of 3)
2887 Laverton, Somerset (St Bartholomew) 1 (of 2)
2888 Laverton, Somerset (St Bartholomew) 2 (of 2)
2889 Limington, Somerset (St James) 4 (of 4)
2890 Litton, Somerset (St Mary) 1 (of 5)
2891 Litton, Somerset (St Mary) 2 (of 5)
2892 Litton, Somerset (St Mary) 4 (of 5)
2893 Locking, Somerset (St Augustine) 2 (of 4)
2894 Long Ashton, Somerset (All Saints) 4 (of 5)
2895 Long Sutton, Somerset (The Holy Trinity) 1 (of 6)
2896 Long Sutton, Somerset (The Holy Trinity) 3 (of 6)
2899 Loxton, Somerset (St Andrew) 1 (of 3)
2900 Loxton, Somerset (St Andrew) 2 (of 3)
2901 Maperton, Somerset (SS Peter & Paul) 1 (of 3)
2902 Martock, Somerset (All Saints) 3 (of 5)
2903 Milton Clevedon, Somerset (St James) 1 (of 4)
2904 Milton Clevedon, Somerset (St James) 4 (of 4)
2905 Monksilver, Somerset (All Saints) 2 (of 5)
2906 Monkton Combe, Somerset (St Michael) 2 (of 2)
2907 Nether Ham, Somerset (St Andrew) 1 (of 2)
2908 Nether Ham, Somerset (St Andrew) 2 (of 2)
2909 Nettlecombe, Somerset (St Mary) 1 (of 3)
2910 Nynehead, Somerset (All Saints) 4 (of 4)
2911 North Barrow, Somerset (St Michael) 1 (of 3)

2912 Northover, Somerset (St Andrew) 4 (of 4)
2914 Norton St Philips, Somerset (St Philip & All Saints) 4 (of 6)
2915 Norton Sub Hamdon, Somerset (St Mary) 5 (of 5)
2916 Nunney, Somerset (St Peter) 5 (of 6)
2917 Old Cleve, Somerset (St Andrew) 2 (of 3)
2918 Orchardleigh, Somerset (Blessed Virgin Mary) 1 (of 1)
2919 Orchard Portman, Somerset (St Michael) 4 (of 4)
2920 Otterford, Somerset (St Leonard) 2 (of 4)
2921 Otterford, Somerset (St Leonard) 3 (of 4)
2922 Otterford, Somerset (St Leonard) 4 (of 4)
2923 Otterhampton, Somerset (All Saints) 1 (of 4)
2924 Over Stowey, Somerset (St Mary Magdalene) 1 (of 5)
2925 Over Stowey, Somerset (St Mary Magdalene) 4 (of 5)
2926 Pendomer, Somerset (St Roch) ? (of ?)
2927 Penselwood, Somerset (St Michael) 1 (of 3)
2928 Pille, Somerset (St Thomas of Canterbury) 2 (of 5)
2929 Pille, Somerset (St Thomas of Canterbury) 3 (of 5)
2930 Pitcombe, Somerset (St Leonard) 1 (of 3)
2931 Pitcombe, Somerset (St Leonard) 2 (of 3)
2932 Pitcombe, Somerset (St Leonard) 3 (of 3)
2933 Pitney, Somerset (St John the Baptist) 1 (of 4)
2934 Pitney, Somerset (St John the Baptist) 2 (of 4)
2935 Poyntington, Somerset (All Saints) 1 (of 3)
2937 Priddy, Somerset (St Lawrence) 2 (of 3)
2938 Priston, Somerset (St Luke) 3 (of 6)
2939 Puckington, Somerset (St Andrew) 3 (of 5)
2940 Puriton, Somerset (St Michael) 3 (of 6)
2941 Puriton, Somerset (St Michael) 4 (of 6)
2942 Puxton, Somerset (St Saviour) 1 (of 2)
2943 Queen Camel, Somerset (St Barnabas) 1 (of 6)
2944 Raddington, Somerset (St Michael) 1 (of 4)
2945 Raddington, Somerset (St Michael) 2 (of 4)
2946 Raddington, Somerset (St Michael) 3 (of 4)
2947 Rimpton, Somerset (St Mary) 3 (of 3)
2948 St Catherine's, Somerset (St Katherine) 2 (of 4)
2949 St Catherine's, Somerset (St Katherine) 3 (of 4)
2950 St Catherine's, Somerset (St Katherine) 4 (of 4)
2951 S Decumans, Somerset (St Peter) 2 (of 5)
2952 Sampford Arundel, Somerset (Holy Cross) 2 (of 5)
2953 Sampford Arundel, Somerset (Holy Cross) 4 (of 5)
2954 Sandford Orcas, Somerset (St Nicholas) 5 (of 5)
2955 Shapwick, Somerset (St Mary) 2 (of 5)
2956 Shepton Montague, Somerset (St Peter) 2 (of 3)
2957 Skilgate, Somerset (St John) 1 (of 5)
2960 South Brent, Somerset (St Michael) 2 (of 5)
2962 Staple Fitzpaine, Somerset (St Peter) 1 (of 5)
2965 Stocklinch Ottersay, Somerset (St Mary) 3 (of 3)
2967 Stoke Rodney, Somerset (St Andrew) 1 (of 4)
2968 Stoke Rodney, Somerset (St Andrew) 2 (of 4)
2969 Stoke Rodney, Somerset (St Andrew) 3 (of 4)
2970 Stoke Rodney, Somerset (St Andrew) 4 (of 4)
2971 Stoke St Mary, Somerset (St Mary) 2 (of 4)
2972 Stoke St Michael, Somerset (St Michael) 3 (of ?)
2973 Stoke-Sub-Hamdon, Somerset (St Andrew) 4 (of 5)
2974 Stoke-Sub-Hamdon, Somerset (St Andrew) 5 (of 5)
2975 Strawley, Somerset (St Michael) 1 (of 3)
2976 Strawley, Somerset (St Michael) 2 (of 3)
2977 Strawley, Somerset (St Michael) 3 (of 3)
2980 Sutton Montis, Somerset (The Holy Trinity) 2 (of 3)
2981 Swell, Somerset (St Katherine) 2 (of 2)
2982 Tellisford, Somerset (All Saints) 2 (of 2)
2984 Thorpe St Margaret, Somerset (St Margaret) 2 (of 3)
2985 Thorpe St Margaret, Somerset (St Margaret) 3 (of 3)
2986 Thurlbeer, Somerset (St Thomas) 1 (of 4)
2987 Thurlbeer, Somerset (St Thomas) 2 (of 4)
2988 Thurlbeer, Somerset (St Thomas) 3 (of 4)
2989 Thurlbeer, Somerset (St Thomas) 4 (of 4)
2990 Thurloxton, Somerset (St Giles) 2 (of 4)
2991 Thurloxton, Somerset (St Giles) 3 (of 4)
2992 Thurloxton, Somerset (St Giles) 4 (of 4)
2993 Timberscombe, Somerset (St Michael) 3 (of 6)
2994 Tollard, Somerset (St John the Baptist) 1 (of 3)
2995 Treborough, Somerset (St Peter) 2 (of 3)
2996 Trent, Somerset (St Andrew) 1 (of 5)
2997 Trent, Somerset (St Andrew) 2 (of 5)
2998 Trent, Somerset (St Andrew) 4 (of 5)
2999 Trull, Somerset (All Saints) 1 (of 5)
3000 Ubley, Somerset (St Bartholomew) 4 (of 4)
3001 Upton, Somerset (St James) 2 (of 3)
3002 Upton, Somerset (St James) 3 (of 3)
3003 Walton, Somerset (The Holy Trinity) 1 (of 5)
3004 Weare, Somerset (St Gregory) 4 (of 5)
3006 Wembdon, Somerset (St George) 2 (of 5)
3007 West Camel, Somerset (All Saints) 2 (of 4)
3008 West Chinnock, Somerset (St Mary) 3 (of 3)
3009 West Hatch, Somerset (St Andrew) 3 (of 5)

3010 West Hatch, Somerset (St Andrew) 4 (of 5)
3011 West Monkton, Somerset (St Augustine) 6 (of 6)
3012 West Quantoxhead, Somerset (St Ethelred alias Audries) 2 (of 4)
3013 West Quantoxhead, Somerset (St Ethelred alias Audries) 3 (of 4)
3014 Weston Bampfylde, Somerset (Holy Cross) 1 (of 3)
3015 Weston Bampfylde, Somerset (Holy Cross) 2 (of 3)
3016 Weston-Super-Mare, Somerset (St John the Baptist) 2 (of 6)
3017 Weston Zoyland, Somerset (St Mary) 2 (of 5)
3018 Whatley, Somerset (St George) 2 (of 5)
3019 Whatley, Somerset (St George) 3 (of 5)
3020 Whatley, Somerset (St George) 4 (of 5)
3021 Whatley, Somerset (St George) 5 (of 5)
3022 White Stanton, Somerset (St Andrew) 3 (of 5)
3023 White Stanton, Somerset (St Andrew) 4 (of 5)
3024 Wilton, Somerset (St George) 2 (of 5)
3025 Wookey, Somerset (St Matthew) 3 (of 5)
3026 Woolavington, Somerset (St Mary) 4 (of 5)
3027 Woolavington, Somerset (St Mary) 5 (of 5)
3028 Woolverton, Somerset (St Lawrence) 1 (of 2)
3029 Woolverton, Somerset (St Lawrence) 2 (of 2)
3030 Wrington, Somerset (All Saints) Sanctus bell (of 1)
3031 Yatton, Somerset (St Mary) 7 (of 8)
3032 Yeovilton, Somerset (St Bartholomew) 3 (of 4)
3033 Acton Trussell, Staffordshire (St James) 2 (of 3)
3034 Adbaston, Staffordshire (St Margaret) Call bell (of 4)
3035 Baswich, Staffordshire (The Holy Trinity) 1 (of 3)
3036 Baswich, Staffordshire (The Holy Trinity) 2 (of 3)
3037 Blithfield, Staffordshire (St Leonard) 3 (of 5)
3038 Blithfield, Staffordshire (St Leonard) 4 (of 5)
3039 Blithfield, Staffordshire (St Leonard) 5 (of 5)
3040 Bramshall, Staffordshire (St Lawrence) 1 (of 3)
3041 Brewood, Staffordshire (SS Mary & Chad) 7 (of 7)
3042 Caverswall, Staffordshire (St Peter) 3 (of 3)
3043 Chapel Chorlton, Staffordshire (St Lawrence) 1 (of 1)
3044 Chebsey, Staffordshire (All Saints) 2 (of 4)
3045 Chebsey, Staffordshire (All Saints) 3 (of 4)
3046 Chebsey, Staffordshire (All Saints) 4 (of 4)
3047 Ellastone, Staffordshire (St Peter) 4 (of 6)
3048 Ellastone, Staffordshire (St Peter) 5 (of 6)
3049 Farewell, Staffordshire (St Bartholomew) 1 (of 3)
3050 Fradswell, Staffordshire (St Mary) 1 (of 3)
3051 Fulford-in-Stone, Staffordshire (St Nicholas) 1 (of 1)
3052 Gnosall, Staffordshire (St Lawrence) 4 (of 6)
3053 Hamstall Ridware, Staffordshire (St Michael) 3 (of 4)
3054 Harlaston, Staffordshire (St Matthew) 2 (of 3)
3055 High Offley, Staffordshire (St Mary the Virgin) 1 (of 4)
3056 High Offley, Staffordshire (St Mary the Virgin) Call bell (of 4)
3057 Keele, Staffordshire (St Michael) 5 (of 6)
3058 Kingstone, Staffordshire (St John) 1 (of 3)
3059 Kingstone, Staffordshire (St John) 2 (of 3)
3060 Lapley, Staffordshire (All Saints) Sanctus bell (of 4)
3061 Lichfield, Staffordshire (SS Mary & Chad) Sanctus bell (of 10)
3062 Lichfield, Staffordshire (St Chad) 4 (of 4)
3063 Mayfield, Staffordshire (St John the Baptist) 2 (of 3)
3064 Milwich, Staffordshire (All Saints) 1 (of 3)
3065 Pipe Ridware, Staffordshire (St James) 1 (of 2)
3066 Pipe Ridware, Staffordshire (St James) 2 (of 2)
3067 Ranton, Staffordshire (All Saints) 1 (of 2)
3068 Stafford, Staffordshire (St Chad) Call bell (of 1)
3069 Standon, Staffordshire (All Saints) 1 (of 3)
3070 Standon, Staffordshire (All Saints) Call bell (of 3)
3071 Stowe, Staffordshire (St John the Baptist) 3 (of 5)
3072 Stowe, Staffordshire (St John the Baptist) 4 (of 5)
3073 Waterfall, Staffordshire (SS James & Bartholomew) 2 (of 3)
3074 Waterfall, Staffordshire (SS James & Bartholomew) 3 (of 3)
3075 Weston-Under-Lyziard, Staffordshire (St Andrew) 1 (of 3)
3076 Weston-Under-Lyziard, Staffordshire (St Andrew) 2 (of 3)
3077 Weston-Under-Lyziard, Staffordshire (St Andrew) 3 (of 3)
3078 Weston-Upon-Trent, Staffordshire (St Andrew) 1 (of 2)
3079 Weston-Upon-Trent, Staffordshire (St Andrew) 2 (of 2)
3080 Whitmore, Staffordshire (St Mary & All Saints) 2 (of 3)
3081 Yoxall, Staffordshire (St Peter) 3 (of 6)

3082 Aldham, Suffolk (St Mary) 1 (of 1)
3083 Ampton, Suffolk (St Peter) 3 (of 4)
3084 Ampton, Suffolk (St Peter) 4 (of 4)
3085 Assington, Suffolk (St Edmund) 3 (of 4)
3086 Assington, Suffolk (St Edmund) 4 (of 4)
3087 Athelington, Suffolk (St Peter) 1 (of 3)
3088 Athelington, Suffolk (St Peter) 2 (of 3)
3089 Athelington, Suffolk (St Peter) 3 (of 3)
3090 Bacton, Suffolk (St Mary) 3 (of 5)
3091 Badley, Suffolk (St Mary) 1 (of 3)
3092 Badwell Ash, Suffolk (St Mary) 5 (of 5)
3093 Barking, Suffolk (St Mary) 4 (of 5)
3094 Barking, Suffolk (St Mary) 5 (of 5)
3095 Barnardiston, Suffolk (All Saints) 3 (of 5)
3096 Barnardiston, Suffolk (All Saints) 5 (of 5)
3097 Barnby, Suffolk (St John the Baptist) 1 (of 1)
3098 Barningham, Suffolk (St Andrew) ? (of ?)
3099 Barningham, Suffolk (St Andrew) ? (of ?)
3100 Barningham, Suffolk (St Andrew) 1 (of ?)
3101 Barsham, Suffolk (The Holy Trinity) 1 (of 1)
3102 Barton Mills, Suffolk (St Mary) 1 (of 3)
3103 Barton Mills, Suffolk (St Mary) 3 (of 3)
3104 Bedfield, Suffolk (St Nicholas) 3 (of 5)
3105 Bedingfield, Suffolk (St Mary) 1 (of 1)
3106 Benhall, Suffolk (St Mary) 5 (of 6)
3107 Bildeston, Suffolk (St Mary) 1 (of 6)
3108 Bildeston, Suffolk (St Mary) 4 (of 6)
3109 Boxford, Suffolk (St Mary) 2 (of 8)
3110 Boxford, Suffolk (St Mary) 6 (of 8)
3111 Boxford, Suffolk (St Mary) 7 (of 8)
3112 Bradfield, Suffolk (St Clare) 1 (of 3)
3113 Bradfield Combust, Suffolk (All Saints) 2 (of 3)
3114 Bradwell, Suffolk (St Nicholas) 1 (of 3)
3115 Bradwell, Suffolk (St Nicholas) 2 (of 3)
3116 Bradwell, Suffolk (St Nicholas) 3 (of 3)
3117 Bramfield, Suffolk (St Andrew) 3 (of 5)
3118 Bramfield, Suffolk (St Andrew) 4 (of 5)
3119 Bramfield, Suffolk (St Andrew) 5 (of 5)
3120 Brampton, Suffolk (St Peter) 5 (of 5)
3121 Brandeston, Suffolk (All Saints) 3 (of 5)
3122 Brandeston, Suffolk (All Saints) 4 (of 5)
3123 Brandon, Suffolk (SS Peter & Paul) 1 (of 3)
3124 Brandon, Suffolk (SS Peter & Paul) 2 (of 3)
3125 Brandon, Suffolk (SS Peter & Paul) 3 (of 3)
3126 Bredfield, Suffolk (St Andrew) 4 (of 4)
3127 Brockley, Suffolk (St Andrew) 1 (of 3)
3128 Brockley, Suffolk (St Andrew) 2 (of 3)
3129 Brockley, Suffolk (St Andrew) 3 (of 3)
3130 Bromeswell, Suffolk (St Edmund) 1 (of 2)
3131 Bromeswell, Suffolk (St Edmund) 2 (of 2)
3132 Bruisyard, Suffolk (St Peter) 3 (of 3)
3133 Brundish, Suffolk (St Lawrence) 2 (of 3)
3134 Brundish, Suffolk (St Lawrence) 3 (of 3)
3135 Bungay, Suffolk (The Holy Trinity) 1 (of 1)
3136 Bungay, Suffolk (St Mary) 1 (of 6)
3137 Bungay, Suffolk (St Mary) 2 (of 6)
3138 Bungay, Suffolk (St Mary) 3 (of 6)
3139 Bury St Edmunds, Suffolk (St James) 3 (of 3)
3140 Butley, Suffolk (St John the Baptist) 1 (of 1)
3141 Butley, Suffolk (St John the Baptist) Sanctus bell? (of 1)
3142 Campsey Ash, Suffolk (St John the Baptist) 2 (of 4)
3143 Capel, Suffolk (St Mary) 1 (of 5)
3144 Capel, Suffolk (St Mary) 5 (of 5)
3145 Charsfield, Suffolk (St Peter) 2 (of 5)
3146 Charsfield, Suffolk (St Peter) 4 (of 5)
3147 Charsfield, Suffolk (St Peter) 5 (of 5)
3148 Chillesford, Suffolk (St Peter) 1? (of 1)
3149 Clare, Suffolk (SS Peter & Paul) 7 (of 8)
3150 Combs, Suffolk (St Mary) 3 (of 4)
3151 Coney Weston, Suffolk (St Mary) 1 (of 1)
3152 Cotton, Suffolk (St Andrew) 4 (of 5)
3153 Cotton, Suffolk (St Andrew) 5 (of 5)
3154 Covehithe, Suffolk (St Andrew) 4 (of 5)
3155 Covehithe, Suffolk (St Andrew) 5 (of 5)
3156 Cransford, Suffolk (St Peter) 2 (of 3)
3157 Cransford, Suffolk (St Peter) 3 (of 3)
3158 Cratfield, Suffolk (St Mary) Clockbell (of ?)
3159 Cretingham, Suffolk (St Peter) 3 (of 5)
3160 Cretingham, Suffolk (St Peter) 4 (of 5)
3161 Cretingham, Suffolk (St Peter) 5 (of 5)
3162 Dalham, Suffolk (St Mary) 5 (of 5)
3163 Dallinghoo, Suffolk (St Mary) 3 (of 4)
3164 Darsham, Suffolk (All Saints) 3 (of 4)
3165 Dennington, Suffolk (St Mary) 1 (of 5)
3166 Dennington, Suffolk (St Mary) 2 (of 5)
3167 Dennington, Suffolk (St Mary) 3 (of 5)
3168 Denston, Suffolk (St Nicholas) 1 (of 2)
3169 Denston, Suffolk (St Nicholas) 2 (of 2)
3170 Depden, Suffolk (St Mary) 1 (of 3)
3171 Depden, Suffolk (St Mary) 2 (of 3)
3172 Earl Soham, Suffolk (St Mary) 2 (of 5)
3173 Earl Soham, Suffolk (St Mary) 4 (of 5)
3174 Earl Stonham, Suffolk (St Mary) 3 (of 5)
3175 Earl Stonham, Suffolk (St Mary) 4 (of 5)
3176 East Bergholt, Suffolk (St Mary) 2 (of 5)
3177 Easton, Suffolk (All Saints) 4 (of 5)
3178 Easton, Suffolk (All Saints) 5 (of 5)
3179 Ellough, Suffolk (All Saints) 1 (of 3)
3180 Elmswell, Suffolk (St John the Evangelist) 3 (of 5)
3181 Eye, Suffolk (SS Peter & Paul) 3 (of 8)
3182 Eye, Suffolk (SS Peter & Paul) Sanctus bell (of 8)
3183 Eyke, Suffolk (All Saints) 3 (of 5)
3184 Eyke, Suffolk (All Saints) 4 (of 5)
3185 Fakenham, Suffolk (St Peter) 1 (of 3)
3186 Felsham, Suffolk (St Peter) 3 (of 6)
3187 Felsham, Suffolk (St Peter) 5 (of 6)
3188 Finningham, Suffolk (St Bartholomew) 2 (of 3)
3189 Finningham, Suffolk (St Bartholomew) 3 (of 3)

3190 Flixton, Suffolk (St Mary) 1 (of 3)
3191 Flixton, Suffolk (St Mary) 2 (of 3)
3192 Fornham, Suffolk (All Saints) 3 (of 4)
3193 Framlingham, Suffolk (St Michael) 4 (of 8)
3194 Framlingham, Suffolk (St Michael) 5 (of 8)
3195 Fressingfield, Suffolk (SS Peter & Paul) 6 (of 8)
3196 Fressingfield, Suffolk (SS Peter & Paul) 8 (of 8)
3197 Friston, Suffolk (St Mary) 2 (of 3)
3198 Friston, Suffolk (St Mary) 3 (of 3)
3199 Frostenden, Suffolk (All Saints) 1 (of 3)
3200 Frostenden, Suffolk (All Saints) 3 (of 3)
3202 Gorleston, Suffolk (St Andrew) 2 (of 4)
3203 Gosbeck, Suffolk (St Mary) 1 (of 1)
3204 Great Ashfield, Suffolk (All Saints) 4 (of 5)
3205 Great Ashfield, Suffolk (All Saints) 5 (of 5)
3206 Great Blakenham, Suffolk (St Mary) 1 (of 2)
3207 Great Blakenham, Suffolk (St Mary) 2 (of 2)
3208 Great Bradley, Suffolk (St Mary) 1 (of 3)
3209 Great Bradley, Suffolk (St Mary) 3 (of 3)
3210 Great Bricett, Suffolk (SS Mary & Lawrence) ? (of ?)
3211 Great Cornard, Suffolk (St Andrew) 4 (of 5)
3212 Great Glemham, Suffolk (All Saints) 1 (of 5)
3213 Great Glemham, Suffolk (All Saints) 3 (of 5)
3214 Great Glemham, Suffolk (All Saints) 5 (of 5)
3215 Great Linstead, Suffolk (St Peter) 1 (of 1)
3216 Great Wenham, Suffolk (St John) 1 (of 3)
3217 Great Wenham, Suffolk (St John) 2 (of 3)
3218 Groton, Suffolk (St Bartholomew) 3 (of 5)
3219 Groton, Suffolk (St Bartholomew) 4 (of 5)
3220 Hacheston, Suffolk (All Saints) 3 (of 5)
3221 Hadleigh, Suffolk (St Mary) 4 (of 8)
3222 Hadleigh, Suffolk (St Mary) 6 (of 8)
3223 Hadleigh, Suffolk (St Mary) Clockbell (of 8)
3224 Halesworth, Suffolk (St Mary) 4 (of 8)
3225 Halesworth, Suffolk (St Mary) 6 (of 8)
3226 Hawstead, Suffolk (All Saints) 1 (of 3)
3227 Hemingstone, Suffolk (St Gregory) 2 (of 3)
3228 Hemingstone, Suffolk (St Gregory) 3 (of 3)
3229 Henley, Suffolk (St Peter) 4 (of 5)
3230 Henley, Suffolk (St Peter) 5 (of 5)
3231 Hepworth, Suffolk (St Peter) 5 (of 5)
3232 Herringfleet, Suffolk (St Margaret) 2 (of 3)
3233 Herringfleet, Suffolk (St Margaret) ? (of 3)
3234 Herringswell, Suffolk (St Ethelbert) 1 (of 3)
3235 Herringswell, Suffolk (St Ethelbert) 2 (of 3)
3236 Herringswell, Suffolk (St Ethelbert) 3 (of 3)
3237 Higham, Suffolk (St Mary) 5 (of 6)
3238 Hinderclay, Suffolk (St Mary) 3 (of 6)
3239 Hinderclay, Suffolk (St Mary) 6 (of 6)
3240 Hollesley, Suffolk (All Saints) 2 (of 3)
3241 Holton, Suffolk (St Peter) 1 (of 3)
3242 Holton, Suffolk (St Peter) 3 (of 3)
3243 Homersfield, Suffolk (St Mary) 2 (of 3)
3244 Homersfield, Suffolk (St Mary) 3 (of 3)
3245 Honington, Suffolk (All Saints) 1 (of 3)
3246 Honington, Suffolk (All Saints) 2 (of 3)
3247 Hoo, Suffolk (SS Andrew & Eustachius) 1 (of 1)
3248 Hoxne, Suffolk (SS Peter & Paul) 4 (of 5)
3249 Hoxne, Suffolk (SS Peter & Paul) 5 (of 5)
3250 Icklingham, Suffolk (All Saints) 1 (of 3)
3251 Icklingham, Suffolk (All Saints) 2 (of 3)
3252 Iken, Suffolk (St Botolph) 1 (of 4)
3253 Iken, Suffolk (St Botolph) 2 (of 4)
3254 Iken, Suffolk (St Botolph) 3 (of 4)
3255 Iken, Suffolk (St Botolph) 4 (of 4)
3256 Ilketshall, Suffolk (St John the Baptist) 1 (of 1)
3257 Ilketshall, Suffolk (St Margaret) 1 (of 3)
3258 Ilketshall, Suffolk (St Margaret) 2 (of 3)
3259 Ilketshall, Suffolk (St Margaret) 3 (of 3)
3260 Ingham, Suffolk (St Bartholomew) 1 (of 1)
3261 Ipswich, Suffolk (St Helen) 2 (of 2)
3262 Ipswich, Suffolk (St Lawrence) 1 (of 5)
3263 Ipswich, Suffolk (St Lawrence) 2 (of 5)
3264 Ipswich, Suffolk (St Lawrence) 3 (of 5)
3265 Ipswich, Suffolk (St Lawrence) 4 (of 5)
3266 Ipswich, Suffolk (St Lawrence) 5 (of 5)
3267 Ipswich, Suffolk (St Mary-At-Elms) 3 (of 5)
3268 Ipswich, Suffolk (St Mary Stoke) 1 (of 2)
3269 Ipswich, Suffolk (St Matthew) 3 (of 5)
3270 Ipswich, Suffolk (St Peter) 3 (of 6)
3271 Ipswich, Suffolk (St Stephen) 1 (of 3)
3272 Ipswich, Suffolk (St Stephen) 2 (of 3)
3273 Ixworth, Suffolk (St Mary) 4 (of 6)
3274 Ixworth, Suffolk (St Mary) 5 (of 6)
3275 Kelsale, Suffolk (St Peter) 7 (of 8)
3276 Kesgrave, Suffolk (All Saints) 1 (of 1)
3277 Kettleburgh, Suffolk (St Andrew) 2 (of 3)
3278 Kirkley, Suffolk (St Peter) 1 (of 1)
3279 Kirton, Suffolk (St Mary) 1 (of 1)
3280 Lakenheath, Suffolk (St Mary) 2 (of 5)
3281 Lakenheath, Suffolk (St Mary) 3 (of 5)
3282 Lakenheath, Suffolk (St Mary) Clockbell (of 5)
3283 Lavenham, Suffolk (SS Peter & Paul) Clockbell (of 8)
3284 Laxfield, Suffolk (All Saints) 3 (of ?)
3285 Laxfield, Suffolk (All Saints) ? (of ?)
3286 Laxfield, Suffolk (All Saints) 2 (of ?)
3287 Little Bealings, Suffolk (All Saints) 2 (of 3)
3288 Layham, Suffolk (St Andrew) 1 (of 1)
3289 Levington, Suffolk (St Peter) 1 (of 3)
3290 Levington, Suffolk (St Peter) 2 (of 3)
3291 Little Bealings, Suffolk (All Saints) 3? (of 3)
3292 Little Cornard, Suffolk (All Saints) 5 (of 5)
3293 Little Finborough, Suffolk (St Bartholomew) 1 (of 1)
3294 Little Saxham, Suffolk (St Nicholas) 1 (of 3)
3295 Little Saxham, Suffolk (St Nicholas) 2 (of 3)
3296 Little Stonham, Suffolk (St Mary) 4 (of 5)

3297 Little Welnetham, Suffolk (St Mary Magdalene) 1 (of 3)
3298 Little Wrattling, Suffolk (St Mary) 1 (of 1)
3299 Market Weston, Suffolk (St Mary) 2 (of 5)
3300 Market Weston, Suffolk (St Mary) 3 (of 5)
3301 Market Weston, Suffolk (St Mary) 4 (of 5)
3302 Marlesford, Suffolk (St Andrew) 1 (of 4)
3303 Marlesford, Suffolk (St Andrew) 4 (of 4)
3304 Martlesham, Suffolk (St Mary) 1 (of 3)
3305 Martlesham, Suffolk (St Mary) 2 (of 3)
3306 Melton, Suffolk (St Andrew) 2 (of 4)
3307 Melton, Suffolk (St Andrew) 3 (of 4)
3308 Melton, Suffolk (St Andrew) 4 (of 4)
3309 Mendlesham, Suffolk (St Mary) 2 (of 5)
3310 Mendlesham, Suffolk (St Mary) 3 (of 5)
3311 Mendlesham, Suffolk (St Mary) Clockbell (of 5)
3312 Metfield, Suffolk (St John the Baptist) 3 (of 3)
3313 Mettingham, Suffolk (All Saints) 3 (of 4)
3314 Mildenhall, Suffolk (St Andrew) 6 (of 8)
3315 Mildenhall, Suffolk (St Andrew) 4 (of 8)
3316 Monk Soham, Suffolk (St Peter) 3 (of 5)
3317 Monk Soham, Suffolk (St Peter) 4 (of 5)
3318 Monkseleigh, Suffolk (St Peter) 4 (of 6)
3319 Monkseleigh, Suffolk (St Peter) 5 (of 6)
3320 Nedging, Suffolk (St Mary) 2 (of 2)
3321 Norton, Suffolk (St Andrew) 1 (of 4)
3322 Oakley, Suffolk (St Nicholas) 4 (of 5)
3323 Offton, Suffolk (St Mary) 3 (of 5)
3324 Ottley, Suffolk (St Mary) 3 (of 6)
3325 Ottley, Suffolk (St Mary) 4 (of 6)
3326 Ottley, Suffolk (St Mary) 5 (of 6)
3327 Parham, Suffolk (St Mary) 1 (of 3)
3328 Parham, Suffolk (St Mary) 2 (of 3)
3329 Peasenhall, Suffolk (St Michael) 4 (of ?)
3330 Peasenhall, Suffolk (St Michael) 5 (of ?)
3331 Pettaugh, Suffolk (St Katherine) 3 (of 3)
3332 Pettaugh, Suffolk (St Katherine) 2 (of 3)
3333 Petistree, Suffolk (SS Peter & Paul) 4 (of 6)
3334 Petistree, Suffolk (SS Peter & Paul) 5 (of 6)
3335 Petistree, Suffolk (SS Peter & Paul) 6 (of 6)
3336 Playford, Suffolk (St Mary) 1 (of 2)
3337 Playford, Suffolk (St Mary) 2 (of 2)
3338 Raydon, Suffolk (St Mary) 1 (of 1)
3339 Rendham, Suffolk (St Michael) 3 (of 5)
3340 Redlingfield, Suffolk (St Andrew) 1 (of 1)
3341 Reydon, Suffolk (St Margaret) 1 (of 1)
3342 Rickinghall Inferior, Suffolk (St Mary) 1 (of 3)
3343 Rickinghall Inferior, Suffolk (St Mary) 3 (of 3)
3344 Ringshall, Suffolk (St Katherine) 2 (of 2)
3345 Risby, Suffolk (St Giles) 1 (of 3)
3346 Risby, Suffolk (St Giles) 3 (of 3)
3347 Rishangles, Suffolk (St Margaret) 1 (of 3)
3348 Rishangles, Suffolk (St Margaret) 2 (of 3)
3349 Rishangles, Suffolk (St Margaret) 3 (of 3)
3350 Rougham, Suffolk (St Mary) 3 (of 5)
3351 Rushmere, Suffolk (St Andrew) 3 (of 6)
3352 Rushmere, Suffolk (St Andrew) 4 (of 6)
3353 Rushmere, Suffolk (St Andrew) 5 (of 6)
3354 Rushmere, Suffolk (St Michael) 1 (of 2)
3355 Rushmere, Suffolk (St Michael) 2 (of 2)
3356 Hoxne, Suffolk (SS Peter & Paul) 3? (of 5)
3357 Sapiston, Suffolk (St Andrew) 4 (of 4)
3358 Saxmundham, Suffolk (St John the Baptist) 3 (of 6)
3359 Saxmundham, Suffolk (St John the Baptist) 4 (of 6)
3360 Saxmundham, Suffolk (St John the Baptist) 5 (of 6)
3361 Saxstead, Suffolk (All Saints) 3 (of 3)
3362 Semer, Suffolk (All Saints) 2 (of 3)
3363 Shelley, Suffolk (All Saints) 3 (of 5)
3364 Shelley, Suffolk (All Saints) 4 (of 5)
3365 Shottisham, Suffolk (St Margaret) 1 (of 1)
3366 Sibton, Suffolk (St Peter) 3 (of 5)
3367 Sibton, Suffolk (St Peter) 4 (of 5)
3368 Sotterley, Suffolk (St Margaret) 2 (of 2)
3369 Somerleyton, Suffolk (St Mary) 3 (of 6)
3370 Somerleyton, Suffolk (St Mary) 4 (of 6)
3371 Somerleyton, Suffolk (St Mary) 5 (of 6)
3372 South Cove, Suffolk (St Lawrence) 1 (of 1)
3373 South Elmham, Suffolk (All Saints) 1 (of 3)
3374 South Elmham, Suffolk (All Saints) 3 (of 3)
3375 South Elmham, Suffolk (St George) 3 (of 5)
3376 South Elmham, Suffolk (St George) 4 (of 5)
3377 South Elmham, Suffolk (St James) 3 (of 4)
3378 South Elmham, Suffolk (St Peter) 1 (of 3)
3379 South Elmham, Suffolk (St Peter) 2 (of 3)
3380 South Elmham, Suffolk (St Peter) 3 (of 3)
3381 Southwold, Suffolk (St Edmund) ? (of 5)
3382 Southwold, Suffolk (St Edmund) ? (of 5)
3383 Little Stonham, Suffolk (St Mary) 3 (of 5)
3384 Little Stonham, Suffolk (St Mary) 5 (of 5)
3385 Peasenhall, Suffolk (St Michael) 3 (of ?)
3386 Southwold, Suffolk (St Edmund) 5 (of 5)
3387 Spexhall, Suffolk (St Peter) 1 (of 1)
3388 Sproughton, Norfolk (All Saints) 5 (of 5)
3389 Stanningfield, Suffolk (St Nicholas) 2 (of 3)
3390 Stanton, Suffolk (All Saints) 1 (of 4)
3391 Stanton, Suffolk (All Saints) 2 (of 4)
3392 Stanton, Suffolk (All Saints) 3 (of 4)
3393 Stanton, Suffolk (St John the Baptist) 3 (of 4)
3394 Stoke Ash, Suffolk (All Saints) ? (of ?)
3395 Stoke Ash, Suffolk (All Saints) ? (of ?)
3396 Stoke Ash, Suffolk (All Saints) 1 (of ?)
3397 Stoke Ash, Suffolk (All Saints) 3 (of ?)
3398 Stoke-by-Clare, Suffolk (St Michael) Clockbell (of 6)
3399 Stoke by Nayland, Suffolk (St Mary) 3 (of 6)
3400 Stoke by Nayland, Suffolk (St Mary) 4 (of 6)
3401 Stowlangtoft, Suffolk (St George) 3 (of 4)

3402 Stowmarket, Suffolk (SS Mary & Peter) 4 (of 8)
3403 Stowmarket, Suffolk (SS Mary & Peter) Clockbell (of 8)
3404 Stradbroke, Suffolk (All Saints) 8 (of 8)
3405 Stratford, Suffolk (St Andrew) 1 (of 3)
3406 Stratford, Suffolk (St Andrew) 2 (of 3)
3407 Stratford, Suffolk (St Andrew) 3 (of 3)
3408 Stratford, Suffolk (St Mary) 6 (of 6)
3409 Stratford, Suffolk (St Mary) 4 (of 6)
3410 Sturston, Suffolk (All Saints) 3 (of 4)
3411 Sudbury, Suffolk (All Saints) 5 (of 8)
3412 Sudbury, Suffolk (All Saints) 6 (of 8)
3413 Sudbury, Suffolk (All Saints) 7 (of 8)
3414 Sudbury, Suffolk (All Saints) Clockbell (of 8)
3415 Sudbury, Suffolk (St Peter) 5 (of 8)
3416 Sudbury, Suffolk (St Peter) 6 (of 8)
3417 Sudbury, Suffolk (St Peter) 8 (of 8)
3418 Swilland, Suffolk (St Mary) 1 (of 1)
3419 Syleham, Suffolk (St Mary) 3 (of 3)
3420 Thornham Magna, Suffolk (St Mary) 3 (of 5)
3421 Thornham Magna, Suffolk (St Mary) 5 (of 5)
3422 Thrandeston, Suffolk (St Margaret) 2 (of 5)
3423 Tostock, Suffolk (St Andrew) 2 (of 4)
3424 Tostock, Suffolk (St Andrew) 3 (of 4)
3425 Tostock, Suffolk (St Andrew) 1 (of 4)
3426 Troston, Suffolk (St Mary) 2 (of 6)
3427 Troston, Suffolk (St Mary) 6 (of 6)
3428 Tuddenham, Suffolk (St Mary) 4 (of 5)
3429 Ubbeston, Suffolk (St Peter) 1 (of 2)
3430 Ufford, Suffolk (St Mary) 2 (of 6)
3431 Ufford, Suffolk (St Mary) 4 (of 6)
3432 Ufford, Suffolk (St Mary) 6 (of 6)
3433 Uggeshall, Suffolk (St Mary) 1 (of 1)
3434 Walton, Suffolk (St Mary) 1 (of 1)
3435 Wangford, Suffolk (St Denis) 2 (of 2)
3436 Washbrook, Suffolk (St Mary) 1 (of 1)
3437 Wattisham, Suffolk (St Nicholas) 2 (of 2)
3438 Wenhaston, Suffolk (St Peter) 4 (of 6)
3439 Wenhaston, Suffolk (St Peter) 6 (of 6)
3440 Westerfield, Suffolk (St Mary) 1 (of 3)
3441 Westerfield, Suffolk (St Mary) 2 (of 3)
3442 Westhorpe, Suffolk (St Margaret) 4 (of 5)
3443 Westleton, Suffolk (St Peter) 1 (of 1)
3444 Weston, Suffolk (St Peter) 1 (of 3)
3445 Weston, Suffolk (St Peter) 2 (of 3)
3446 Weston, Suffolk (St Peter) 3 (of 3)
3447 Wetheringsett, Suffolk (All Saints) 3 (of 5)
3448 Weybread, Suffolk (St Andrew) 2 (of 3)
3449 Wherstead, Suffolk (St Mary) 3 (of 3)
3451 Wickham Market, Suffolk (All Saints) 4 (of 6)
3452 Wickham Market, Suffolk (All Saints) Clockbell (of 6)
3453 Wilby, Suffolk (St Mary) 6 (of 6)
3454 Wisset, Suffolk (St Andrew) 4 (of 5)
3455 Wisset, Suffolk (St Andrew) 5 (of 5)
3456 Withersdale, Suffolk (St Mary Magdalene) 2 (of 2)
3457 Wixoe, Suffolk (St Leonard) 1 (of 1)
3458 Woolpit, Suffolk (St Mary) 3 (of 6)
3459 Wordwell, Suffolk (All Saints) 1 (of 1)
3460 Worlington, Suffolk (All Saints) 5 (of 5)
3461 Wyverstone, Suffolk (St George) 3 (of 3)
3462 Yaxley, Suffolk (St Mary) 5 (of 6)
3463 Addington, Surrey (Blessed Virgin Mary) 3 (of 4)
3464 Addington, Surrey (Blessed Virgin Mary) 4 (of 4)
3465 Betchworth, Surrey (St Michael) 3 (of 5)
3466 Bisley, Surrey (St John) 2 (of 3)
3467 Burstow, Surrey (St Bartholomew) 1 (of 4)
3468 Byfleet, Surrey (St Mary) 3 (of 3)
3469 Chaldon, Surrey (SS Peter & Paul) 1 (of 1)
3470 Chelsham, Surrey (St Leonard) 2 (of 2)
3471 Chertsey, Surrey (St Peter) 5 (of 8)
3472 Chiddingfold, Surrey (St Mary) 3 (of 6)
3473 Chobham, Surrey (St Lawrence) 3 (of 5)
3474 East Clandon, Surrey (St Thomas of Canterbury) 1 (of 3)
3475 East Horsley, Surrey (St Martin) 3 (of 4)
3476 Ewhurst, Surrey (SS Peter & Paul) 3 (of 6)
3477 Ewhurst, Surrey (SS Peter & Paul) 4 (of 6)
3478 Great Bookham, Surrey (St Nicholas) 1 (of 2)
3479 Headley, Surrey (St Mary) 1 (of 1)
3480 Horne, Surrey (St Mary the Virgin) 1 (of 3)
3481 Limpsfield, Surrey (SS Peter & Paul) 3 (of 6)
3482 Limpsfield, Surrey (SS Peter & Paul) 5 (of 6)
3483 Limpsfield, Surrey (SS Peter & Paul) 6 (of 6)
3484 Merrow, Surrey (St John) 3 (of 3)
3485 Merstham, Surrey (St Katherine) 1 (of 4)
3486 Merton, Surrey (St Mary) 2 (of 3)
3487 Old Woking, Surrey (St Peter) 5 (of 5)
3488 Pyrford, Surrey (St Nicholas) 1 (of 2)
3489 Seale, Surrey (unknown) 6 (of 6)
3490 Stoke D'abernon, Surrey (St Mary) 3 (of 3)
3492 Thursley, Surrey (St Michael) 2 (of 3)
3493 Walton-on-Thames, Surrey (St Mary) 4 (of 6)
3494 Walton-on-the-Hill, Surrey (St Peter) 2 (of 3)
3495 Warlingham, Surrey (All Saints) 1 (of 1)
3496 Wimbledon, Surrey (St Mary) 5 (of 6)
3497 Wotton, Surrey (St John the Evangelist) 1 (of 3)
3498 Wotton, Surrey (St John the Evangelist) 2 (of 3)
3499 Aldbourne, Sussex (St Bartholomew) 1 (of 1)
3500 Alciston, Sussex (unknown) 1 (of 2)
3501 Alciston, Sussex (unknown) 2 (of 2)

3502 Alfriston, Sussex (St Andrew) 6 (of 6)
3503 Angmering, Sussex (St Margaret) Clockbell (of 5)
3504 Appledram, Sussex (St Mary) 1 (of 2)
3505 Appledram, Sussex (St Mary) 2 (of 2)
3506 Ardingley, Sussex (St Peter) 3 (of 5)
3507 Ashburnham, Sussex (St Peter) Sanctus bell (of 4)
3508 Ashington, Sussex (SS Peter & Paul) 1 (of 2)
3509 Balcombe, Sussex (St Mary) 2 (of 4)
3510 Barnham, Sussex (St Mary) 1 (of 1)
3511 Beckley, Sussex (All Saints) Sanctus bell (of 6)
3512 Beddingham, Sussex (St Andrew) 3 (of 4)
3513 Bexhill, Sussex (St Peter) 3 (of 4)
3514 Binsted, Sussex (St Mary) 1 (of 1)
3515 Birdham, Sussex (St James) 1 (of 2)
3516 Bolney, Sussex (St Mary Magdalene) 3 (of 8)
3517 Botolphs, Sussex (St Botolph) 1 (of 3)
3518 Botolphs, Sussex (St Botolph) 2 (of 3)
3519 Botolphs, Sussex (St Botolph) 3 (of 3)
3520 Bramber, Sussex (St Nicholas) 1 (of 1)
3521 Brede, Sussex (St George) 3 (of 6)
3522 Burton, Sussex (St Luke) 1 (of 1)
3523 Catsfield, Sussex (St Lawrence) 1 (of 3)
3524 Catsfield, Sussex (St Lawrence) 2 (of 3)
3525 Chichester, Sussex (The Holy Trinity) Service bell (of 8)
3526 Chichester, Sussex (St Martin) 1 (of 1)
3527 Chichester, Sussex (St Peter the Less) 2 (of 3)
3528 Clapham, Sussex (St Mary) 1 (of 3)
3529 Clapham, Sussex (St Mary) 2 (of 3)
3530 Clapham, Sussex (St Mary) 3 (of 3)
3531 Clayton, Sussex (St John the Baptist) 1 (of 3)
3532 Clayton, Sussex (St John the Baptist) 3 (of 3)
3533 Coates, Sussex (St Agatha) 1 (of 1)
3534 Cocking, Sussex (unknown) 1 (of 3)
3535 Cocking, Sussex (unknown) 2 (of 3)
3536 Cold Waltham, Sussex (St Giles) 1 (of 3)
3537 Cold Waltham, Sussex (St Giles) 2 (of 3)
3538 Coombes, Sussex (unknown) 1 (of 1)
3539 Duncton, Sussex (The Holy Trinity) 2 (of ?)
3540 Easebourne, Sussex (St Mary) 1 (of 4)
3541 Easebourne, Sussex (St Mary) 3 (of 4)
3542 East Dean, Sussex (All Saints) 1 (of 4)
3543 East Dean, Sussex (All Saints) 4 (of 4)
3544 East Dean, Sussex (SS Simon & Jude) 1 (of 3)
3545 East Preston, Sussex (St Mary) 2 (of 3)
3546 Edburton, Sussex (St Andrew) 1 (of 3)
3547 Edburton, Sussex (St Andrew) 3 (of 3)
3548 Elsted, Sussex (St Paul) 2 (of 2)
3549 Etchingham, Sussex (The Assumption & St Nicholas) 1 (of ?)
3550 Fairlight, Sussex (St Andrew) 1 (of 1)
3551 Felpham, Sussex (St Mary the Virgin) 2 (of 4)
3552 Findon, Sussex (St John the Baptist) 2 (of 4)
3553 Findon, Sussex (St John the Baptist) 3 (of 4)
3554 Findon, Sussex (St John the Baptist) Sanctus bell (of 4)
3555 Fittleworth, Sussex (St Mary) 1 (of 3)
3556 Fittleworth, Sussex (St Mary) 3 (of 3)
3557 Folkington, Sussex (St Peter) 1 (of 1)
3558 Ford, Sussex (St Andrew) 1 (of 2)
3559 Graffham, Sussex (St Giles) 1 (of 4)
3560 Guestling, Sussex (St Lawrence) 1 (of 1)
3561 Hardham, Sussex (St Botolph) 1 (of 2)
3562 Heathfield, Sussex (All Saints) 6 (of 6)
3563 Heyshott, Sussex (St James) 2 (of 3)
3564 Hollington, Sussex (St Leonard) 1 (of 1)
3565 Hove, Sussex (St Andrew) 1 (of 1)
3566 Hunston, Sussex (St Leodegarius) 1 (of 2)
3567 Iford, Sussex (St Nicholas) 1 (of 3)
3568 Iford, Sussex (St Nicholas) 2 (of 3)
3569 Iford, Sussex (St Nicholas) 3 (of 3)
3570 Jevington, Sussex (St Andrew) ? (of 3)
3571 Keymer, Sussex (SS Cosmas & Damian) 2 (of 3)
3572 Kingston-by-Lewes, Sussex (St Pancras) 1 (of 3)
3573 Kingston-by-Lewes, Sussex (St Pancras) 2 (of 3)
3574 Kingston-by-Lewes, Sussex (St Pancras) 3 (of 3)
3575 Lewes, Sussex (All Saints) 3 (of 3)
3577 Lewes, Sussex (St Anne) 2 (of 3)
3579 Little Horsted, Sussex (St Michael & All Angels) 1 (of 3)
3580 Loxwood, Sussex (St John the Baptist) 1 (of 1)
3581 Lynchmere, Sussex (St Peter) 1 (of 2)
3582 Madehurst, Sussex (St Mary Magdalene) 1 (of 2)
3583 Madehurst, Sussex (St Mary Magdalene) 2 (of 2)
3584 Mountfield, Sussex (All Saints) 1 (of 1)
3585 Ninfield, Sussex (St Mary the Virgin) 1 (of 1)
3586 North Mundham, Sussex (St Stephen) 3 (of 3)
3587 Ovingdean, Sussex (St Wulfram) 1 (of 1)
3588 Parham, Sussex (St Peter) 1 (of 1)
3589 Patcham, Sussex (All Saints) 1 (of 3)
3590 Pevensey, Sussex (St Nicholas) 3 (of 3)
3591 Portslade, Sussex (St Nicholas) 2 (of 3)
3592 Poynings, Sussex (The Holy Trinity) 1 (of ?)
3593 Preston, Sussex (St Peter) 2 (of 3)
3594 Pulborough, Sussex (St Mary) 2 (of 5)
3595 Pyecombe, Sussex (The Transfiguration) 1 (of 1)
3596 Rotherfield, Sussex (St Denis) 1 (of 5)
3597 Rotherfield, Sussex (St Denis) 3 (of 5)

3599 Selham, Sussex (St James) 1 (of 1)
3600 Sidlesham, Sussex (St Mary) 3 (of 3)
3601 Singleton, Sussex (St John the Evangelist) 1 (of 2)
3602 Southease, Sussex (St Peter) 1 (of 2)
3603 Southease, Sussex (St Peter) 2 (of 2)
3604 Southover, Sussex (St John the Baptist) 1 (of 1)
3605 Stopham, Sussex (St Mary the Virgin) 3 (of 3)
3606 Stoughton, Sussex (St Mary) 2 (of 3)
3607 Streat, Sussex (unknown) 1 (of 1)
3608 Sullington, Sussex (St Mary) 1 (of 1)
3609 Tangmere, Sussex (St Andrew) 2 (of 3)
3610 Tarring Neville, Sussex (St Mary) 1 (of 1)
3611 Twineham, Sussex (St Peter) 1 (of 3)
3612 Twineham, Sussex (St Peter) 2 (of 3)
3613 Udimore, Sussex (St Mary) 2 (of 3)
3614 Upper Beeding, Sussex (St Peter) 1 (of 3)
3615 Upper Beeding, Sussex (St Peter) 2 (of 3)
3616 Up Waltham, Sussex (The Ascension) 1 (of 1)
3617 Warminghurst, Sussex (The Holy Sepulchre) 1 (of 1)
3618 Washington, Sussex (St Mary) 1 (of 4)
3619 Washington, Sussex (St Mary) 2 (of 4)
3620 West Chiltington, Sussex (St Mary) 1 (of 4)
3621 Westfield, Sussex (St John the Baptist) 1 (of 3)
3622 West Hoathly, Sussex (St Margaret) 2 (of 5)
3623 West Itchenor, Sussex (St Nicholas) 1 (of 3)
3624 West Tarring, Sussex (St Andrew) ? (of 5)
3625 West Thorney, Sussex (St Nicholas) 1 (of 1)
3626 Whatlington, Sussex (St Mary) 1 (of 3)
3629 Wivelsfield, Sussex (SS Peter & John the Baptist) 4 (of 5)
3630 Woodmancote, Sussex (St Peter) 2 (of 3)
3631 Woodmancote, Sussex (St Peter) 3 (of 3)
3632 Woolbeding, Sussex (All Hallows) 3 (of 3)
3633 Yapton, Sussex (St Mary) 4 (of 4)
3634 Tangmere, Sussex (St Andrew) 3 (of 3)
3635 Allesley, Warwickshire (All Saints) 2 (of 5)
3636 Atherstone, Warwickshire (St Mary) 1 (of 1)
3637 Atherstone-on-Stour, Warwickshire (St Mary) 1 (of 3)
3638 Atherstone-on-Stour, Warwickshire (St Mary) 2 (of 3)
3639 Aston Cantlow, Warwickshire (St John the Baptist) 4 (of 5)
3640 Baddesley Clinton, Warwickshire (St Michael) 1 (of 3)
3641 Baginton, Warwickshire (St John the Baptist) 1 (of 2)
3642 Barston, Warwickshire (St Swithin) 3 (of 5)
3643 Baxterley, Warwickshire (unknown) 2 (of 2)
3644 Bearley, Warwickshire (St Mary the Virgin) 2 (of 2)
3645 Beaudesert, Warwickshire (St Nicholas) 1 (of 3)
3646 Beaudesert, Warwickshire (St Nicholas) 2 (of 3)
3647 Berkswell, Warwickshire (St John the Baptist) 3 (of 4)
3648 Berkswell, Warwickshire (St John the Baptist) Sanctus bell (of 4)
3649 Bilton, Warwickshire (St Mark) 2 (of 5)
3650 Bilton, Warwickshire (St Mark) 3 (of 5)
3651 Bilton, Warwickshire (St Mark) 4 (of 5)
3652 Brailes, Warwickshire (St George) 2 (of 6)
3653 Brailes, Warwickshire (St George) 6 (of 6)
3654 Brailes, Warwickshire (St George) Sanctus bell (of 6)
3655 Butler's Marston, Warwickshire (SS Peter & Paul) 2 (of 5)
3656 Combrooke, Warwickshire (SS Mary & Margaret) 1 (of 1)
3657 Corley, Warwickshire (unknown) 2 (of 5)
3658 Corley, Warwickshire (unknown) 4 (of 5)
3659 Coventry, Warwickshire (St John the Baptist) 3 (of 5)
3660 Coventry, Warwickshire (St John the Baptist) 4 (of 5)
3661 Coventry, Warwickshire (St Michael) 6 (of 6)
3662 Curdworth, Warwickshire (SS Nicholas & Peter) 3 (of 3)
3663 Exhall, Warwickshire (St Giles) 1 (of 2)
3664 Exhall, Warwickshire (St Giles) 2 (of 2)
3665 Gaydon, Warwickshire (St Giles) 1 (of 1)
3666 Great Packington, Warwickshire (St James) Sanctus bell (of 1)
3667 Halford, Warwickshire (St Mary) 1 (of 3)
3668 Halford, Warwickshire (St Mary) 2 (of 3)
3669 Haseley, Warwickshire (St Mary) 1 (of 3)
3670 Hatton, Warwickshire (The Holy Trinity) 1 (of 5)
3671 Hunningham, Warwickshire (St Margaret) 1 (of 2)
3672 Hunningham, Warwickshire (St Margaret) 2 (of 2)
3673 Ipsley, Warwickshire (St Peter) 1 (of 3)
3674 Kenilworth, Warwickshire (St Nicholas) 2 (of 5)
3675 Ladbroke, Warwickshire (All Saints) 1 (of 4)
3676 Lapworth, Warwickshire (St Mary the Virgin) 3 (of 5)
3677 Leek Wootton, Warwickshire (All Saints) 5 (of 5)
3678 Lighthorne, Warwickshire (St Lawrence) 4 (of 4)
3679 Lillington, Warwickshire (St Mary) 1 (of 3)
3680 Long Compton, Warwickshire (SS Peter & Paul) Sanctus bell (of 6)
3681 Mancetter, Warwickshire (St Peter) 2 (of 5)
3682 Mancetter, Warwickshire (St Peter) 4 (of 5)
3683 Merevale, Warwickshire (St Mary the Virgin) 1 (of 2)

3684 Merevale, Warwickshire (St Mary the Virgin) 2 (of 2)
3685 Meriden, Warwickshire (St Lawrence) 5 (of 5)
3686 Milverton, Warwickshire (St James) 3 (of 3)
3687 Monks Kirby, Warwickshire (St Edith) 3 (of 6)
3688 Morton Bagot, Warwickshire (The Holy Trinity) 1 (of 2)
3689 Morton Bagot, Warwickshire (The Holy Trinity) 2 (of 2)
3690 Norton Lindsey, Warwickshire (The Holy Trinity) 2 (of 2)
3691 Offchurch, Warwickshire (St Gregory) 1 (of 4)
3692 Offchurch, Warwickshire (St Gregory) 3 (of 4)
3693 Old Berrow, Warwickshire (St Mary) 1 (of 3)
3694 Over Whitacre, Warwickshire (St Leonard) 1 (of 2)
3695 Ryton-on-Dunsmore, Warwickshire (St Leonard) 1 (of 3)
3696 Seckington, Warwickshire (All Saints) 1 (of 2)
3697 Sheldon, Warwickshire (St Giles) 2 (of 4)
3698 Stoke-by-Coventry, Warwickshire (St Michael) 2 (of 3)
3699 Stoke-by-Coventry, Warwickshire (St Michael) 3 (of 3)
3700 Stoneleigh, Warwickshire (St Mary) 2 (of 5)
3701 Stoneleigh, Warwickshire (St Mary) 4 (of 5)
3703 Ullenhall, Warwickshire (St Mary the Virgin) ? (of ?)
3704 Ullenhall, Warwickshire (St Mary the Virgin) ? (of ?)
3705 Warwick, Warwickshire (St Mary) 3 (of 6)
3706 Warwick, Warwickshire (St Mary) 5 (of 6)
3707 Whitchurch, Warwickshire (St Mary) 1 (of 1)
3708 Wixford, Warwickshire (St Milburgha) 1 (of 2)
3709 Wolfhamcote, Warwickshire (St Peter) 2 (of 2)
3710 Wolston, Warwickshire (St Margaret) 2 (of 4)
3711 Wolverton, Warwickshire (St Mary) 2 (of 2)
3712 Wolvey, Warwickshire (St John the Baptist) 3 (of 3)
3713 Wormleighton, Warwickshire (St Peter) 2 (of 3)
3714 Wroxall, Warwickshire (St Leonard) 3 (of 3)
3715 Wyken, Warwickshire (St Mary Magdalene) 1 (of 1)
3716 Great Somerford, Wiltshire (St Michael & All Angels) 1 (of ?)
3717 Appleby, Westmorland (St Michael Bongate) 1 (of 2)
3718 Appleby, Westmorland (St Michael Bongate) 2 (of 2)
3719 Asby, Westmorland (St Peter) ? (of ?)
3720 Bampton, Westmorland (St Patrick) 1 (of 2)
3721 Bampton, Westmorland (St Patrick) 2 (of 2)
3722 Brough, Westmorland (St Michael) 4 (of 4)
3723 Brougham Chapel, Westmorland (St Wilfrid) 1 (of ?)
3724 Brougham Chapel, Westmorland (St Wilfrid) 2 (of ?)
3725 Burneside, Westmorland (St Oswald) 1 (of ?)
3726 Crook, Westmorland (St Katherine) 1 (of 1)
3727 Crosby Garrett, Westmorland (St Andrew) 1 (of 2)
3728 Crosby Garrett, Westmorland (St Andrew) 2 (of 2)
3729 Crosthwaite, Westmorland (St Mary the Virgin) 1 (of 3)
3730 Kendal, Westmorland (The Holy Trinity) Sanctus bell (of 1)
3731 Kirkby Stephen, Westmorland (unknown) ? (of ?)
3732 Kirkby Thore, Westmorland (St Michael) 1 (of 1)
3733 Little Strickland, Westmorland (St Mary) 1 (of 1)
3734 Long Marton, Westmorland (SS Margaret & James) 1 (of 3)
3735 Long Marton, Westmorland (SS Margaret & James) 2 (of 3)
3736 Long Marton, Westmorland (SS Margaret & James) 3 (of 3)
3737 Mallerstang, Westmorland (St Mary) 1 (of 1)
3738 Martindale, Westmorland (St Martin) 1 (of 1)
3739 Musgrave, Westmorland (St Theobald) 1 (of 2)
3740 Musgrave, Westmorland (St Theobald) 2 (of 2)
3741 Ormside, Westmorland (St James) 2 (of 3)
3742 Ormside, Westmorland (St James) 3 (of 3)
3743 Orton, Westmorland (All Saints) 1 (of 3)
3744 Patterdale, Westmorland (St Patrick) Disused (of 8)
3745 Ravenstonedale, Westmorland (St Oswald) 2 (of 3)
3746 Shap, Westmorland (St Michael) ? (of 3)
3747 Staveley, Westmorland (St James) ? (of ?)
3748 Strickland Ketel, Westmorland (St Oswald) 1 (of 1)
3749 Thrimby, Westmorland (St Mary) 1 (of ?)
3750 Aldbourne, Wiltshire (St Michael) 6 (of 8)
3751 Aldbourne, Wiltshire (St Michael) 8 (of 8)
3752 Alderbury, Wiltshire (St Mary) 1 (of 1)
3753 Allington, Wiltshire (St John the Baptist) 3 (of 3)
3754 Ashley, Wiltshire (St James) 1 (of 3)

3755 Ashley, Wiltshire (St James) 3 (of 3)
3756 Atworth, Wiltshire (St Michael & All Angels) 1 (of 3)
3757 Baverstock, Wiltshire (St Edith) 1 (of 3)
3758 Baverstock, Wiltshire (St Edith) 2 (of 3)
3759 Baverstock, Wiltshire (St Edith) 3 (of 3)
3760 Bemerton, Wiltshire (SS John & Andrew) 1 (of 1)
3761 Biddestone, Wiltshire (SS Nicholas & Peter) 1 (of 2)
3762 Biddestone, Wiltshire (SS Nicholas & Peter) 2 (of 2)
3763 Bowerchalke, Wiltshire (The Holy Trinity) 3 (of 3)
3764 Box, Wiltshire (St Thomas of Canterbury) 2 (of 4)
3765 Box, Wiltshire (St Thomas of Canterbury) 3 (of 4)
3766 Brixton Deverill, Wiltshire (St Michael) 1 (of 1)
3767 Broadchalke, Wiltshire (All Saints) 6 (of 6)
3768 Broughton Gifford, Wiltshire (St Mary) 2 (of 2)
3769 Buttermere, Wiltshire (St James) 1 (of 1)
3770 Calne, Wiltshire (St Mary the Virgin) Sanctus bell (of 8)
3771 Castle Combe, Wiltshire (St Andrew) Sanctus bell (of 1)
3772 Castle Eaton, Wiltshire (St Mary) Sanctus bell (of 6)
3773 Charlton, Wiltshire (St John the Baptist) ? (of 5)
3774 Charlton, Wiltshire (St Peter) 1 (of 3)
3775 Cherhill, Wiltshire (St James) 2 (of 3)
3776 Chilmark, Wiltshire (St Margaret) 1 (of 4)
3777 Chilmark, Wiltshire (St Margaret) 2 (of 4)
3778 Chiseldon, Wiltshire (Holy Cross) 4 (of 5)
3779 Chitterne, Wiltshire (All Saints With St Mary) ? (of ?)
3780 Chitterne, Wiltshire (All Saints With St Mary) 3 (of ?)
3781 Colerne, Wiltshire (St John the Baptist) 6 (of 8)
3782 Collingbourne Ducis, Wiltshire (St Mary) 4 (of 5)
3783 Compton Basset, Wiltshire (St Swithin) 4 (of 5)
3784 Corston, Wiltshire (All Saints) 1 (of 2)
3785 Crudwell, Wiltshire (All Saints) 1 (of 3)
3786 Crudwell, Wiltshire (All Saints) 2 (of 3)
3787 Crudwell, Wiltshire (All Saints) 3 (of 3)
3788 Dilton, Wiltshire (St Mary) 2 (of 2)
3789 Dinton, Wiltshire (St Mary) 6 (of 6)
3790 Ditcheridge, Wiltshire (St Christopher) 1 (of 1)
3791 Donhead, Wiltshire (St Andrew) 3 (of 4)
3792 Downton, Wiltshire (St Lawrence) 2 (of 4)
3793 Durnford, Wiltshire (St Andrew) 4 (of 5)
3795 Etchilhampton, Wiltshire (St Andrew) 2 (of 2)
3796 Fonthill Bishop's, Wiltshire (All Saints) 2 (of 2)
3797 Fovant, Wiltshire (St George) 1 (of 3)
3798 Fyfield, Wiltshire (St Nicholas) 1 (of 2)
3799 Garesdon, Wiltshire (All Saints) 1 (of 2)
3800 Great Cheverell, Wiltshire (St Peter) 4 (of 5)
3801 Grittleton, Wiltshire (St Mary the Virgin) 3 (of 5)
3802 Grittleton, Wiltshire (St Mary the Virgin) 5 (of 5)
3803 Hankerton, Wiltshire (Holy Cross) 1 (of 4)
3804 Hankerton, Wiltshire (Holy Cross) 3 (of 4)
3805 Hankerton, Wiltshire (Holy Cross) 4 (of 4)
3806 Heytesbury, Wiltshire (SS Peter & Paul) 6 (of 6)
3807 Hill Deverill, Wiltshire (St Mary) 1 (of 1)
3808 Hillmarton, Wiltshire (St Lawrence) 3 (of 5)
3809 Holt, Wiltshire (St Katherine) 4 (of 5)
3810 Keevil, Wiltshire (St Leonard) Sanctus bell (of 6)
3811 Kemble, Wiltshire (All Saints) 3 (of 5)
3812 Kingston St Michael, Wiltshire (St Michael) 3 (of 3)
3813 Knook, Wiltshire (St Margaret) 1 (of 1)
3814 Leigh, Wiltshire (All Saints) 2 (of 3)
3815 Little Cheverell, Wiltshire (St Nicholas) 1 (of 2)
3816 Little Cheverell, Wiltshire (St Nicholas) 2 (of 2)
3817 Little Hinton, Wiltshire (St Swithin) 3 (of 3)
3818 Littleton Drew, Wiltshire (St Andrew) 1 (of 3)
3819 Littleton Drew, Wiltshire (St Andrew) 2 (of 3)
3820 Littleton Drew, Wiltshire (St Andrew) 3 (of 3)
3821 Long Newnton, Wiltshire (The Holy Trinity) 4 (of 6)
3822 Luckington, Wiltshire (St Mary) 2 (of 4)
3823 Lyneham, Wiltshire (St Michael) 4 (of 5)
3824 Maddington, Wiltshire (St Mary) 1 (of 3)
3825 Malmesbury, Wiltshire (St Aldhelm) 1 (of 5)
3826 Manningford Abbots, Wiltshire (unknown) 1 (of 1)
3827 Mere, Wiltshire (St Michael) 5 (of 6)
3828 Milston, Wiltshire (St Mary) 1 (of 1)
3829 Netherhampton, Wiltshire (St Katherine) 2 (of 3)
3830 Nettleton, Wiltshire (St Mary) 6 (of 6)
3831 Newton Toney, Wiltshire (St Andrew) 4 (of 4)
3832 North Newnton, Wiltshire (St James) 2 (of 4)
3833 Norton Bavent, Wiltshire (All Saints) 2 (of 4)
3834 Nunton, Wiltshire (St Andrew) 1 (of 3)
3835 Oaksey, Wiltshire (All Saints) 6 (of 6)

3836 Odstock, Wiltshire (St Mary) 3 (of 3)
3837 Ogbourne St Andrew, Wiltshire (St Andrew) 5 (of 5)
3841 Patney, Wiltshire (St Swithin) 1 (of 2)
3842 Patney, Wiltshire (St Swithin) 2 (of 2)
3843 Pertwood, Wiltshire (St Peter) 1 (of 1)
3844 Pewsey, Wiltshire (St John the Baptist) 4 (of 6)
3846 Porton, Wiltshire (St Nicholas) 1 (of 2)
3847 Poulshot, Wiltshire (St Peter) 1 (of 3)
3848 Rollestone, Wiltshire (St Andrew) 1 (of 1)
3849 Rushall, Wiltshire (St Andrew) 1 (of 3)
3852 Seagry, Wiltshire (St Mary) 1 (of 1)
3853 Semington, Wiltshire (St George) 1 (of 1)
3854 Semley, Wiltshire (St Leonard) 2 (of 6)
3855 Sherrington, Wiltshire (St Michael) 1 (of 1)
3856 Somerford Keynes, Wiltshire (All Saints) 1 (of 3)
3857 Somerford Keynes, Wiltshire (All Saints) 3 (of 3)
3858 Somerford Keynes, Wiltshire (All Saints) Sanctus bell (of 3)
3859 South Marston, Wiltshire (St Mary Magdalene) 1 (of 3)
3860 South Marston, Wiltshire (St Mary Magdalene) 2 (of 3)
3861 South Newton, Wiltshire (St Andrew) 2 (of 4)
3862 South Newton, Wiltshire (St Andrew) 3 (of 4)
3863 Stanton St Bernard, Wiltshire (All Saints) 1 (of 2)
3864 Stanton St Bernard, Wiltshire (All Saints) 2 (of 2)
3865 Stockton, Wiltshire (St John the Baptist) 4 (of 4)
3866 Sutton Benger, Wiltshire (All Saints) 2 (of 5)
3867 Sutton Mandeville, Wiltshire (All Saints) 1 (of 3)
3868 Swallowcliffe, Wiltshire (St Peter) 3 (of 3)
3869 Teffont Magna, Wiltshire (unknown) 1 (of 2)
3870 Tockenham, Wiltshire (St John the Evangelist) 1 (of 1)
3871 Tollard Royal, Wiltshire (St Peter Ad Vincula) 3 (of 5)
3872 Tollard Royal, Wiltshire (St Peter Ad Vincula) 5 (of 5)
3873 Tytherton Lucas, Wiltshire (St Nicholas) 1 (of 1)
3874 Urchfont, Wiltshire (St Michael) 1 (of 8)
3875 Warminster, Wiltshire (St Denis) 5 (of 6)
3876 Warminster, Wiltshire (St Denis) 3 (of 6)
3877 West Cholderton, Wiltshire (St Nicholas) 1 (of 1)
3878 West Dean, Wiltshire (St Mary) 1 (of 3)
3879 West Harnham, Wiltshire (St George) 1 (of 2)
3880 West Kington, Wiltshire (St Mary) 2 (of 4)
3881 West Overton, Wiltshire (St Michael) 1 (of ?)
3882 Westwood, Wiltshire (St Mary) 2 (of 4)
3883 Westwood, Wiltshire (St Mary) 3 (of 4)
3884 Westwood, Wiltshire (St Mary) 4 (of 4)
3885 Winkfield, Wiltshire (St Andrew) 3 (of 3)
3886 Winsley, Wiltshire (St Nicholas) 1 (of 3)
3887 Winsley, Wiltshire (St Nicholas) 3 (of 3)
3888 Winterbourne Earls, Wiltshire (St Michael) 3 (of 3)
3889 Winterbourne Gunner, Wiltshire (St Mary) 2 (of 2)
3890 Winterbourne Stoke, Wiltshire (St Peter) 1 (of 4)
3891 Winterbourne Stoke, Wiltshire (St Peter) 3 (of 4)
3892 Woodford, Wiltshire (All Saints) 3 (of 4)
3893 Wylye, Wiltshire (St Mary) 2 (of 4)
3894 Abberley, Worcestershire (St Michael) 4 (of 4)
3895 Abbot's Moreton, Worcestershire (St Peter) 4 (of 4)
3896 Aston White Ladies, Worcestershire (St John the Baptist) 3 (of 3)
3897 Bayton, Worcestershire (St Bartholomew) 1 (of 3)
3898 Berrow, Worcestershire (St Faith) 3 (of 4)
3899 Berrow, Worcestershire (St Faith) 4 (of 4)
3900 Besford, Worcestershire (St Peter) 1 (of 2)
3901 Besford, Worcestershire (St Peter) 2 (of 2)
3902 Birtsmorton, Worcestershire (SS Peter & Paul) 3 (of 4)
3903 Bretforton, Worcestershire (St Leonard) 5 (of 5)
3904 Broadwas, Worcestershire (St Mary Magdalene) 4 (of 4)
3905 Broadway, Worcestershire (St Eadburgha) 6 (of 6)
3906 Broughton Hackett, Worcestershire (St Leonard) 1 (of 2)
3907 Broughton Hackett, Worcestershire (St Leonard) 2 (of 2)
3908 Church Honeybourne, Worcestershire (St Ecgwin) 5 (of 5)
3909 Claines, Worcestershire (St John the Baptist) 2 (of 5)
3910 Cotheridge, Worcestershire (St Leonard) 1 (of 4)
3911 Croome Hill, Worcestershire (St Mary) 1 (of 3)
3912 Croome Hill, Worcestershire (St Mary) 2 (of 3)
3913 Defford, Worcestershire (St James) 1 (of 3)
3914 Dormstone, Worcestershire (St Nicholas) 3 (of 3)
3915 Doverdale, Worcestershire (St Mary) 3 (of 3)
3916 Droitwich, Worcestershire (St Peter) 6 (of 6)

3917 Elmley Castle, Worcestershire (St Mary) 3 (of 6)
3926 Fladbury, Worcestershire (St John the Baptist) Sanctus bell (of 6)
3927 Flyford Flavel, Worcestershire (St Peter) 2 (of 2)
3928 Great Malvern, Worcestershire (St Mary) 4 (of 6)
3929 Grimley, Worcestershire (St Bartholomew) 6 (of 6)
3930 Hadzor, Worcestershire (St John the Baptist) 2 (of 3)
3931 Hanley William, Worcestershire (All Saints) 1 (of 3)
3932 Halesowen, Worcestershire (St John the Baptist) 3 (of 8)
3933 Halesowen, Worcestershire (St John the Baptist) 4 (of 8)
3934 Halesowen, Worcestershire (St John the Baptist) 5 (of 8)
3935 Halesowen, Worcestershire (St John the Baptist) 6 (of 8)
3936 Hallow, Worcestershire (SS Philip & James) 2 (of 3)
3937 Hallow, Worcestershire (SS Philip & James) 3 (of 3)
3938 Hartlebury, Worcestershire (St James) 3 (of 5)
3939 Holt, Worcestershire (St Martin) 2 (of 4)
3940 Holt, Worcestershire (St Martin) Sanctus bell (of 4)
3941 Knighton-on-Teme, Worcestershire (St Michael) 2 (of 3)
3942 Knighton-on-Teme, Worcestershire (St Michael) Sanctus bell (of 3)
3943 Lindridge, Worcestershire (St Lawrence) Sanctus bell (of 3)
3944 Little Malvern, Worcestershire (St Giles) 1 (of 1)
3945 Longdon, Worcestershire (St Mary) 1 (of 5)
3946 Longdon, Worcestershire (St Mary) 2 (of 5)
3947 Longdon, Worcestershire (St Mary) 3 (of 5)
3948 Longdon, Worcestershire (St Mary) 5 (of 5)
3949 Mamble, Worcestershire (St John the Baptist) 2 (of 3)
3950 Mamble, Worcestershire (St John the Baptist) 3 (of 3)
3951 Newland, Worcestershire (St Leonard) 1 (of 2)
3952 Norton-by-Evesham, Worcestershire (St Ecgwin) 1 (of 4)
3953 Norton-by-Evesham, Worcestershire (St Ecgwin) 2 (of 4)
3954 Norton-by-Kempsey, Worcestershire (St James) 2 (of 3)
3955 Oddingley, Worcestershire (St James) 2 (of 3)
3956 Oldberrow, Worcestershire (St Mary) 1 (of 3)
3957 Overbury, Worcestershire (St Faith) 1 (of ?)
3958 Pershore, Worcestershire (Holy Cross) ? (of ?)
3959 Ribbesford, Worcestershire (St Leonard) 3 (of 3)
3960 Shelsley Beauchamp, Worcestershire (All Saints) Sanctus bell (of 6)
3961 Shelsley Walsh, Worcestershire (St Andrew) 1? (of 1?)
3962 South Littleton, Worcestershire (St Michael) 1 (of 3)
3963 South Littleton, Worcestershire (St Michael) 3 (of 3)
3964 Spetchley, Worcestershire (All Saints) 1 (of 4)
3965 Spetchley, Worcestershire (All Saints) 2 (of 4)
3966 Spetchley, Worcestershire (All Saints) 3 (of 4)
3967 Spetchley, Worcestershire (All Saints) 4 (of 4)
3968 Stanford-on-Teme, Worcestershire (St Mary) 3 (of 4)
3969 Stanford-on-Teme, Worcestershire (St Mary) 4 (of 4)
3970 Stockton, Worcestershire (St Andrew) 1 (of 3)
3971 Stone, Worcestershire (St Mary) 4 (of 4)
3972 Tidmington, Worcestershire (unknown) 3 (of 3)
3973 Warndon, Worcestershire (St Nicholas) 3 (of 3)
3974 Warndon, Worcestershire (St Nicholas) 1 (of 3)
3975 Wichenford, Worcestershire (St Lawrence) 2 (of 3)
3976 Worcester, Worcestershire (St Andrew) 1 (of 1)
3977 Worcester, Worcestershire (St Martin) 3? (of 3)
3978 Worcester, Worcestershire (St Michael) 3 (of 3)
3979 Worcester, Worcestershire (St Michael) 1 (of 3)
3980 Worcester, Worcestershire (St Swithin) 3 (of 6)
3981 Worcester, Worcestershire (St Swithin) 4 (of 6)
3982 Worcester, Worcestershire (St Swithin) 5 (of 6)
3983 Bransford, Worcestershire (St John the Baptist) 1 (of 3)
3984 Croome D'abitot, Worcestershire (St Mary Magdalene) Sanctus bell (of 6)
3985 Dudley, Worcestershire (St James) 1 (of 1)
3986 Rochford, Worcestershire (St Michael) 2 (of 2)
3987 Stoke Bliss, Worcestershire (unknown) Sanctus bell (of 3)

3996 Worcester, Worcestershire (St Clement) Sanctus bell (of 1)
3997 Porton, Wiltshire (St Nicholas) 2 (of 2)
3998 Aldborough, Yorkshire (East Riding)(St Bartholomew) 2 (of 3)
3999 Allerthorpe, Yorkshire (East Riding)(St Botolph) 1 (of 2)
4000 Allerthorpe, Yorkshire (East Riding)(St Botolph) 2 (of 2)
4001 Atwick, Yorkshire (East Riding)(St Lawrence) 2 (of 2)
4002 Auburn, Yorkshire (East Riding)(St Nicholas) ? (of 2)
4003 Barmby-Moor, Yorkshire (East Riding)(St Katherine) 1 (of 3)
4004 Bempton, Yorkshire (East Riding)(St Michael) 1 (of 2)
4005 Bempton, Yorkshire (East Riding)(St Michael) 2 (of 2)
4006 Bessingby, Yorkshire (East Riding)(St Mary Magdalene) 1 (of 1)
4008 Beverley, Yorkshire (East Riding)(St John the Baptist) 6 (of 8)
4009 Beverley, Yorkshire (East Riding)(St John the Baptist) 8 (of 8)
4010 Beverley, Yorkshire (East Riding)(St Mary) 2 (of 6)
4011 Beverley, Yorkshire (East Riding)(St Mary) 3 (of 6)
4012 Bielby, Yorkshire (East Riding)(St Giles) 2 (of 2)
4013 Blacktoft, Yorkshire (East Riding)(St Clement) 2 (of 3)
4014 Boynton, Yorkshire (East Riding)(St Andrew) 2 (of 2)
4015 Brandesburton, Yorkshire (East Riding)(St Mary) 2 (of 2)
4016 Brantingham, Yorkshire (East Riding)(All Saints) 1 (of 3)
4017 Brantingham, Yorkshire (East Riding)(All Saints) 2 (of 3)
4018 Burnby, Yorkshire (East Riding)(St Giles) 2 (of 2)
4019 Butterwick, Yorkshire (East Riding)(St Nicholas) 1 (of 2)
4020 Butterwick, Yorkshire (East Riding)(St Nicholas) 2 (of 2)
4021 Catwick, Yorkshire (East Riding)(St Michael) 1 (of 2)
4022 Catwick, Yorkshire (East Riding)(St Michael) 2 (of 2)
4023 Cherry Burton, Yorkshire (East Riding)(St Michael) 2 (of 3)
4024 Dalton Holme, Yorkshire (East Riding)(St Mary) Sanctus bell (of 2)
4025 Easington, Yorkshire (East Riding)(All Saints) 3 (of 3)
4026 East Cottingwith, Yorkshire (East Riding)(unknown) 1 (of 2)
4027 East Cottingwith, Yorkshire (East Riding)(unknown) 2 (of 2)
4028 Eastrington, Yorkshire (East Riding)(St Michael) 3 (of 3)
4029 Elstronwick, Yorkshire (East Riding)(St Lawrence) 1 (of 1)
4030 Elvington, Yorkshire (East Riding)(The Holy Trinity) 1 (of 2)
4031 Etton, Yorkshire (East Riding)(St Mary) 2 (of 2)
4032 Everingham, Yorkshire (East Riding)(St Everilda) 2 (of 3)
4033 Folkton, Yorkshire (East Riding)(St John the Evangelist) 2 (of 3)
4034 Fridaythorpe, Yorkshire (East Riding)(unknown) 1 (of 2)
4035 Fridaythorpe, Yorkshire (East Riding)(unknown) 2 (of 2)
4036 Fulford, Yorkshire (East Riding)(St Oswald) 1 (of 1)
4037 Full Sutton, Yorkshire (East Riding)(St Mary the Virgin) 2 (of 2)
4038 Goodmanham, Yorkshire (East Riding)(All Hallows) 2 (of 3)
4039 Great Givendale, Yorkshire (East Riding)(St Ethelburga) 1 (of 2)
4040 Great Givendale, Yorkshire (East Riding)(St Ethelburga) 2 (of 2)
4041 Halsham, Yorkshire (East Riding)(All Saints) 1 (of 2)
4042 Halsham, Yorkshire (East Riding)(All Saints) 2 (of 2)
4043 Hayton, Yorkshire (East Riding)(St Martin) 1 (of 3)
4044 Hayton, Yorkshire (East Riding)(St Martin) 2 (of 3)
4045 Hayton, Yorkshire (East Riding)(St Martin) 3 (of 3)
4046 Helperthorpe, Yorkshire (East Riding)(St George) 1 (of 2)
4047 Heslington, Yorkshire (East Riding)(SS Peter & Paul) 1 (of 2)
4048 Heslington, Yorkshire (East Riding)(SS Peter & Paul) 2 (of 2)
4049 Holme-on-the-Wolds, Yorkshire (East Riding)(St Peter) 1 (of 1)
4050 Howden, Yorkshire (East Riding)(St Peter) Scholar's bell (of 8)
4051 Hunmanby, Yorkshire (East Riding)(All Saints) ? (of 3)
4052 Kirby Grindalyth, Yorkshire (East Riding)(St Andrew) 2 (of 3)
4053 Kirby Grindalyth, Yorkshire (East Riding)(St Andrew) 3 (of 3)
4054 Knapton, Yorkshire (East Riding)(St Edmund) 1 (of 2)
4055 Langton, Yorkshire (East Riding)(St Andrew) 1 (of 2)

4056 Langton, Yorkshire (East Riding)(St Andrew) 2 (of 2)
4057 Leppington, Yorkshire (East Riding)(St Helen) 2 (of 2)
4058 Lisset, Yorkshire (East Riding)(St James) 1 (of 2)
4059 Lisset, Yorkshire (East Riding)(St James) 2 (of 2)
4060 Little Driffield, Yorkshire (East Riding)(St Peter) 1 (of 1)
4061 Long Riston, Yorkshire (East Riding)(St Margaret) 1 (of 2)
4062 Lund, Yorkshire (East Riding)(All Saints) 1 (of 2)
4063 Millington, Yorkshire (East Riding)(unknown) 1 (of 2)
4064 Millington, Yorkshire (East Riding)(unknown) 2 (of 2)
4065 Nafferton, Yorkshire (East Riding)(All Saints) 1 (of 2)
4066 Nafferton, Yorkshire (East Riding)(All Saints) 2 (of 2)
4067 North Burton, Yorkshire (East Riding)(St Cuthbert) 1 (of 2)
4068 North Dalton, Yorkshire (East Riding)(All Saints) 1 (of 1)
4069 North Ferriby, Yorkshire (East Riding)(All Saints) 4 (of 5)
4070 North Grimston, Yorkshire (East Riding)(St Nicholas) 1 (of 2)
4071 North Grimston, Yorkshire (East Riding)(St Nicholas) 2 (of 2)
4072 Reighton, Yorkshire (East Riding)(St Peter) 2 (of 2)
4073 Rowley, Yorkshire (East Riding)(St Peter) 1 (of 1)
4074 Ruston Parva, Yorkshire (East Riding)(St Nicholas) 1 (of 2)
4075 Ruston Parva, Yorkshire (East Riding)(St Nicholas) 2 (of 2)
4076 Sancton, Yorkshire (East Riding)(All Saints) 1 (of 3)
4077 Sancton, Yorkshire (East Riding)(All Saints) 3 (of 3)
4080 Shipton, Yorkshire (East Riding)(unknown) 2 (of 2)
4081 Skerne, Yorkshire (East Riding)(St Leonard) 1 (of 2)
4082 Skerne, Yorkshire (East Riding)(St Leonard) 2 (of 2)
4083 Skipwith, Yorkshire (East Riding)(St Helen) 1 (of 3)
4084 Sproatley, Yorkshire (East Riding)(St Swithin) 1 (of 2)
4085 Sproatley, Yorkshire (East Riding)(St Swithin) 2 (of 2)
4086 Thorganby, Yorkshire (East Riding)(St Helen) 2 (of 3)
4087 Thorngumbald, Yorkshire (East Riding)(St Mary) 1 (of 1)
4088 Thornton, Yorkshire (East Riding)(St Michael) 2 (of 2)
4089 Thorpe Bassett, Yorkshire (East Riding)(All Saints) 1 (of 2)
4090 Thorpe Bassett, Yorkshire (East Riding)(All Saints) 2 (of 2)
4091 Tunstall, Yorkshire (East Riding)(All Saints) 1 (of 2)
4092 Tunstall, Yorkshire (East Riding)(All Saints) 2 (of 2)
4093 Warter, Yorkshire (East Riding)(St James) 1 (of 2)
4094 Welton, Yorkshire (East Riding)(SS Simon & Jude) 3 (of 4)
4095 Welton, Yorkshire (East Riding)(SS Simon & Jude) 4 (of 4)
4096 West Heslerton, Yorkshire (East Riding)(St Andrew) 1 (of 2)
4097 West Heslerton, Yorkshire (East Riding)(St Andrew) 2 (of 2)
4098 Westow, Yorkshire (East Riding)(St Mary) 2 (of 3)
4099 Westow, Yorkshire (East Riding)(St Mary) 3 (of 3)
4100 Wetwang, Yorkshire (East Riding)(St Nicholas) 2 (of 2)
4101 Wharram-Le-Street, Yorkshire (East Riding)(St Mary) 1 (of 2)
4102 Willerby, Yorkshire (East Riding)(St Peter) 2 (of 3)
4103 Winestead, Yorkshire (East Riding)(St Germanus) 1 (of 1)
4104 Wold Newton, Yorkshire (East Riding)(All Saints) 1 (of 2)
4105 Yapham, Yorkshire (East Riding)(St Martin) 2 (of 2)
4106 York (North Street), Yorkshire (East Riding)(All Saints) Sanctus bell (of 2)
4107 York (Pavement), Yorkshire (East Riding)(All Saints) 1 (of 3)
4108 York (Pavement), Yorkshire (East Riding)(All Saints) 2 (of 3)
4109 York (Goodramgate), Yorkshire (East Riding)(Holy Trinity Goodramgate) 3 (of 3)
4110 York (King's Square), Yorkshire (East Riding)(The Holy Trinity) 1 (of 6)
4111 York (King's Square), Yorkshire (East Riding)(The Holy Trinity) 2 (of 6)
4112 York (King's Square), Yorkshire (East Riding)(The Holy Trinity) 3 (of 6)
4113 York (Micklegate), Yorkshire (East Riding)(The Holy Trinity) 2 (of 2)
4114 York, Yorkshire (East Riding)(St Crux) 1 (of 2)
4115 York (Micklegate), Yorkshire (East Riding)(St John) 2 (of 6)

4116 York (Micklegate), Yorkshire (East Riding)(St John) 4 (of 6)
4117 York (Micklegate), Yorkshire (East Riding)(St John) 5 (of 6)
4118 York (Micklegate), Yorkshire (East Riding)(St John) 6 (of 6)
4119 York (Micklegate), Yorkshire (East Riding)(St John) Sanctus bell (of 6)
4120 York (Bishopshill Junior), Yorkshire (East Riding)(St Mary) 1 (of 2)
4121 York (Bishopshill Junior), Yorkshire (East Riding)(St Mary) 2 (of 2)
4122 York, Yorkshire (East Riding)(St Sampson) 1 (of 1)
4123 York, Yorkshire (East Riding)(St Peter) 1 (of 8)
4124 York, Yorkshire (East Riding)(St Peter) 5 (of 8)
4125 York, Yorkshire (East Riding)(St Peter) 4 (of 8)
4126 Acaster Malbis, Yorkshire (West Riding)(The Holy Trinity) 1 (of 2)
4127 Ackworth, Yorkshire (West Riding)(St Cuthbert) 4 (of 6)
4128 Ackworth, Yorkshire (West Riding)(St Cuthbert) 5 (of 6)
4129 Airmyn, Yorkshire (West Riding)(St David) 1 (of 2)
4130 Allerton Mauleverer, Yorkshire (West Riding)(St Martin) 3 (of 3)
4131 Almondbury, Yorkshire (West Riding)(All Hallows) 2 (of 3)
4132 Aldborough, Yorkshire (West Riding)(St Andrew) 4 (of 6)
4133 Aldborough, Yorkshire (West Riding)(St Andrew) 5 (of 6)
4134 Arncliffe, Yorkshire (West Riding)(St Oswald) 1 (of 3)
4135 Badsworth, Yorkshire (West Riding)(St Mary the Virgin) 1 (of 4)
4136 Barnburgh, Yorkshire (West Riding)(St Peter) 1 (of 3)
4137 Barnby Don, Yorkshire (West Riding)(SS Peter & Paul) 1 (of 3)
4138 Barwick-in-Elmet, Yorkshire (West Riding)(All Saints) 1 (of 3)
4139 Bentham, Yorkshire (West Riding)(St John the Baptist) 3 (of 3)
4140 Bolton-by-Boland, Yorkshire (West Riding)(SS Peter & Paul) 1 (of 3)
4141 Bolton-by-Boland, Yorkshire (West Riding)(SS Peter & Paul) 2 (of 3)
4142 Bolton-on-Dearne, Yorkshire (West Riding)(St Andrew) 1 (of 3)
4143 Bolton-on-Dearne, Yorkshire (West Riding)(St Andrew) 2 (of 3)
4144 Bolton-on-Dearne, Yorkshire (West Riding)(St Andrew) Sanctus bell (of 3)
4145 Braithwell, Yorkshire (West Riding)(St James) 2 (of 3)
4146 Brayton, Yorkshire (West Riding)(St Wilfrid) 3 (of 3)
4147 Brotherton, Yorkshire (West Riding)(St Edward the Confessor) 2 (of 3)
4148 Cantley, Yorkshire (West Riding)(St Wilfrid) 1 (of 3)
4149 Carlton-in-Skipton, Yorkshire (West Riding)(St Mary) 2 (of 3)
4150 Cawood, Yorkshire (West Riding)(All Saints) 2 (of 3)
4151 Cawthorne, Yorkshire (West Riding)(All Saints) 1 (of 3)
4152 Cawthorne, Yorkshire (West Riding)(All Saints) 2 (of 3)
4153 Cold Coniston-With-Kilnsey, Yorkshire (West Riding)(St Mary) 1 (of 2)
4154 Cowthorpe, Yorkshire (West Riding)(St Michael) 3 (of 3)
4155 Crofton, Yorkshire (West Riding)(All Saints) 2 (of 3)
4156 Crofton, Yorkshire (West Riding)(All Saints) 1 (of 3)
4157 Darfield, Yorkshire (West Riding)(All Saints) 3 (of 6)
4158 Darfield, Yorkshire (West Riding)(All Saints) 4 (of 6)
4159 Darrington, Yorkshire (West Riding)(All Saints & St Luke) 2 (of 6)
4160 Dunsforth, Yorkshire (West Riding)(St Mary) 2 (of 2)
4161 Featherstone, Yorkshire (West Riding)(All Saints) 1 (of 3)
4162 Featherstone, Yorkshire (West Riding)(All Saints) 2 (of 3)
4163 Featherstone, Yorkshire (West Riding)(All Saints) 3 (of 3)
4164 Felkirk, Yorkshire (West Riding)(St Peter) 4 (of 6)
4165 Fishlake, Yorkshire (West Riding)(St Cuthbert) 5 (of 6)
4166 Fishlake, Yorkshire (West Riding)(St Cuthbert) 6 (of 6)
4167 Gargrave, Yorkshire (West Riding)(St Andrew) 6 (of 8)
4168 Goldsbrough, Yorkshire (West Riding)(St Mary) 1 (of 3)
4169 Goldsbrough, Yorkshire (West Riding)(St Mary) 2 (of 3)
4170 Hemsworth, Yorkshire (West Riding)(St Helen) 2 (of 3)
4171 Hemsworth, Yorkshire (West Riding)(St Helen) 3 (of 3)
4172 Hooton Pagnell, Yorkshire (West Riding)(All Saints) 3 (of 3)
4173 Hooton Roberts, Yorkshire (West Riding)(St Peter) 1 (of 3)

4174 Hooton Roberts, Yorkshire (West Riding)(St Peter) 2 (of 3)
4175 Kellington, Yorkshire (West Riding)(St Edmund) 2 (of 3)
4176 Kirk Bramwith, Yorkshire (West Riding)(St Mary) 1 (of 1)
4177 Church Fenton, Yorkshire (West Riding)(St Mary) 1 (of 3)
4178 Kirk Smeaton, Yorkshire (West Riding)(St Peter) 3 (of 3)
4179 Knottingley, Yorkshire (West Riding)(St Botolph) 1 (of 1)
4180 Laughton-En-Le-Morthen, Yorkshire (West Riding)(All Saints) 1 (of 3)
4181 Leathley, Yorkshire (West Riding)(St Oswald) 2 (of 4)
4182 Leathley, Yorkshire (West Riding)(St Oswald) 3 (of 4)
4183 Ledsham, Yorkshire (West Riding)(All Saints) 1 (of 3)
4184 Ledsham, Yorkshire (West Riding)(All Saints) 2 (of 3)
4185 Little Ouseburn, Yorkshire (West Riding)(The Holy Trinity) 3 (of 3)
4186 Long Marston, Yorkshire (West Riding)(All Saints) 2 (of 3)
4187 Maltby, Yorkshire (West Riding)(St Bartholomew) 1 (of 3)
4188 Marton-Cum-Grafton, Yorkshire (West Riding)(Christchurch) 1 (of 1)
4189 High Melton, Yorkshire (West Riding)(St James) 2 (of 3)
4190 Mexborough, Yorkshire (West Riding)(St John the Baptist) 1 (of 3)
4191 Mexborough, Yorkshire (West Riding)(St John the Baptist) 2 (of 3)
4192 Nun Monckton, Yorkshire (West Riding)(St Mary) 1 (of 3)
4193 Owston, Yorkshire (West Riding)(All Saints) 2 (of 3)
4194 Baslow, Derbyshire (St Anne) 5 (of 6)
4195 Pateley Bridge, Yorkshire (West Riding)(St Cuthbert) Disused (of 6)
4196 Penistone, Yorkshire (West Riding)(St John the Baptist) 3 (of 6)
4197 Penistone, Yorkshire (West Riding)(St John the Baptist) 4 (of 6)
4198 Ripon, Yorkshire (West Riding)(St Wilfrid) 2 (of 5)
4199 Ripon, Yorkshire (West Riding)(St Wilfrid) 3 (of 5)
4200 Ripon, Yorkshire (West Riding)(St Wilfrid) Clockbell (of 5)
4201 Ripon, Yorkshire (West Riding)(St Mary Magdalene) 1 (of 1)
4202 Royston, Yorkshire (West Riding)(St John the Baptist) 5 (of 6)
4203 Rylstone, Yorkshire (West Riding)(St Peter) 1 (of 3)
4204 Rylstone, Yorkshire (West Riding)(St Peter) 2 (of 3)
4205 Saxton, Yorkshire (West Riding)(All Saints) 1 (of 3)
4206 Saxton, Yorkshire (West Riding)(All Saints) 2 (of 3)
4207 Saxton, Yorkshire (West Riding)(All Saints) 3 (of 3)
4208 Silkstone, Yorkshire (West Riding)(All Saints) 6 (of 6)
4209 Skelbrooke, Yorkshire (West Riding)(St Michael & All Angels) 1 (of 3)
4210 Skelbrooke, Yorkshire (West Riding)(St Michael & All Angels) 2 (of 3)
4211 South Stainley, Yorkshire (West Riding)(All Saints) 1 (of 2)
4212 South Stainley, Yorkshire (West Riding)(All Saints) 2 (of 2)
4213 Spofforth, Yorkshire (West Riding)(All Saints) 2 (of 4)
4214 Stainburn, Yorkshire (West Riding)(St Mary) 1 (of 1)
4215 Stainton, Yorkshire (West Riding)(St Peter) 3 (of 3)
4216 Stainton, Yorkshire (West Riding)(St Peter) 2 (of 3)
4217 Swinefleet, Yorkshire (West Riding)(St Margaret) 1 (of 1)
4218 Kirk Smeaton, Yorkshire (West Riding)(St Peter) 1 (of 3)
4219 Thorne, Yorkshire (West Riding)(St Nicholas) 6 (of 8)
4220 Thorne, Yorkshire (West Riding)(St Nicholas) 7 (of 8)
4221 Thorner, Yorkshire (West Riding)(St Peter) 1 (of 3)
4222 Thornton-in-Craven, Yorkshire (West Riding)(St Mary) 3 (of 4)
4223 Thornton-in-Craven, Yorkshire (West Riding)(St Mary) 4 (of 4)
4224 Thorpe Salvin, Yorkshire (West Riding)(St Peter) 1 (of 3)
4225 Thrybergh, Yorkshire (West Riding)(St Leonard) 5 (of 5)
4226 Wadworth, Yorkshire (West Riding)(St John the Baptist) 3 (of 4)
4227 Wadworth, Yorkshire (West Riding)(St John the Baptist) 4 (of 4)
4228 Wales, Yorkshire (West Riding)(St John) 2 (of 3)
4229 Wales, Yorkshire (West Riding)(St John) 3 (of 3)
4230 Walton, Yorkshire (West Riding)(St Peter) 1 (of 3)
4231 Walton, Yorkshire (West Riding)(St Peter) 2 (of 3)
4232 Walton, Yorkshire (West Riding)(St Peter) 3 (of 3)

4233 Warmfield, Yorkshire (West Riding)(St Peter) 3 (of 3)
4234 Weston, Yorkshire (West Riding)(All Saints) 1 (of 2)
4235 Weston, Yorkshire (West Riding)(All Saints) 2 (of 2)
4236 Whiston, Yorkshire (West Riding)(St Mary Magdalene) 1 (of 3)
4237 Whiston, Yorkshire (West Riding)(St Mary Magdalene) 2 (of 3)
4238 Wickersley, Yorkshire (West Riding)(St Alban) 3 (of 3)
4239 Woolley, Yorkshire (West Riding)(St Peter) 3 (of 3)
4240 Ainderby Steeple, Yorkshire (North Riding)(St Helen) 1 (of 3)
4241 Allerston, Yorkshire (North Riding)(St John) 3 (of 3)
4242 Amotherby, Yorkshire (North Riding)(St Helen) 1 (of 2)
4243 Amotherby, Yorkshire (North Riding)(St Helen) 2 (of 2)
4244 Bedale, Yorkshire (North Riding)(St Gregory) 8 (of 8)
4245 Bilsdale Kirkham, Yorkshire (North Riding)(St Hilda) 1 (of 2)
4246 Bilsdale Kirkham, Yorkshire (North Riding)(St Hilda) 2 (of 2)
4247 Birdforth, Yorkshire (North Riding)(St Mary) 1 (of 2)
4248 Birdforth, Yorkshire (North Riding)(St Mary) 2 (of 2)
4249 Birkby, Yorkshire (North Riding)(St Peter) 1 (of 2)
4250 Birkby, Yorkshire (North Riding)(St Peter) 2 (of 2)
4251 Brafferton, Yorkshire (North Riding)(St Augustine) 4 (of 6)
4252 Brandsby, Yorkshire (North Riding)(All Saints) 1 (of 2)
4253 Bransdale, Yorkshire (North Riding)(St Nicholas) ? (of 2)
4254 Brignall, Yorkshire (North Riding)(St Mary) 1 (of 1)
4255 Brompton (near Scarborough), Yorkshire (North Riding)(All Saints) 1 (of 3)
4256 Brompton (near Scarborough), Yorkshire (North Riding)(All Saints) 3 (of 3)
4257 Brotton Parva, Yorkshire (North Riding)(St Margaret) ? (of 2)
4258 Bulmer, Yorkshire (North Riding)(St Martin) 1 (of 3)
4259 Bulmer, Yorkshire (North Riding)(St Martin) 2 (of 3)
4260 Burneston, Yorkshire (North Riding)(St Lambert) 4 (of 6)
4261 Buttercrambe, Yorkshire (North Riding)(St John) 1 (of 2)
4262 Castle Bolton, Yorkshire (North Riding)(St Oswald) 1 (of 1)
4263 Cayton, Yorkshire (North Riding)(St John the Baptist) ? (of 3)
4264 Cold Kirby, Yorkshire (North Riding)(St Michael) 1 (of 2)
4265 Coxwold, Yorkshire (North Riding)(St Michael) 3 (of 3)
4266 Crathorne, Yorkshire (North Riding)(All Saints) 1 (of 4)
4267 Cundall, Yorkshire (North Riding)(St Mary & All Saints) 3 (of 3)
4268 Dalby, Yorkshire (North Riding)(St Peter) 1 (of 2)
4269 Deighton, Yorkshire (North Riding)(All Saints) 1 (of 2)
4270 Deighton, Yorkshire (North Riding)(All Saints) 2 (of 2)
4271 Downholme, Yorkshire (North Riding)(St Michael & All Angels) 1 (of 2)
4272 Easby, Yorkshire (North Riding)(St Agatha) 1 (of 2)
4273 Easby, Yorkshire (North Riding)(St Agatha) 2 (of 2)
4274 Great Edstone, Yorkshire (North Riding)(St Michael) 1 (of 2)
4275 Great Edstone, Yorkshire (North Riding)(St Michael) 2 (of 2)
4276 Egton, Yorkshire (North Riding)(St Hilda) ? (of 3)
4277 Egton, Yorkshire (North Riding)(St Hilda) ? (of 3)
4278 Eryholme, Yorkshire (North Riding)(St Mary) 1 (of 2)
4279 Farlington, Yorkshire (North Riding)(St Leonard) 2 (of 2)
4280 Foston, Yorkshire (North Riding)(All Saints) 1 (of 2)
4281 Foston, Yorkshire (North Riding)(All Saints) 2 (of 2)
4283 Great Ayton, Yorkshire (North Riding)(Christchurch) 1 (of 1)
4284 Grinton, Yorkshire (North Riding)(St Andrew) 6 (of 6)
4285 Hawnby, Yorkshire (North Riding)(All Saints) 2 (of 2)
4286 Holtby, Yorkshire (North Riding)(The Holy Trinity) 2 (of 2)
4287 Hutton Buscel, Yorkshire (North Riding)(St Matthew) 2 (of 3)
4288 Hutton Magna, Yorkshire (North Riding)(St Mary) ? (of 2)
4289 Huttons Ambo, Yorkshire (North Riding)(St Margaret) ? (of 2)
4290 Ingleby Arncliffe, Yorkshire (North Riding)(All Saints) 2 (of 2)
4291 Ingleby Greenhow, Yorkshire (North Riding)(St Andrew) 1 (of 2)

4292 Ingleby Greenhow, Yorkshire (North Riding)(St Andrew) 2 (of 2)
4293 Kirkby Fleetham, Yorkshire (North Riding)(St Mary) 2 (of 3)
4294 Kirkby Fleetham, Yorkshire (North Riding)(St Mary) 3 (of 3)
4295 Kirkby-in-Cleveland, Yorkshire (North Riding)(St Augustine) 2 (of 2)
4296 Kirkby-on-the-Moor, Yorkshire (North Riding)(All Hallows) 6 (of 6)
4297 Kirkdale, Yorkshire (North Riding)(St Athanasius) 1 (of 2)
4298 Kirkdale, Yorkshire (North Riding)(St Athanasius) 2 (of 2)
4299 Kirk Leavington, Yorkshire (North Riding)(St Martin) 1 (of 3)
4300 Leake, Yorkshire (North Riding)(St Mary) 3 (of 3)
4301 Levisham, Yorkshire (North Riding)(St Mary) 1 (of 2)
4302 Liverton, Yorkshire (North Riding)(St Michael) ? (of ?)
4303 Liverton, Yorkshire (North Riding)(St Michael) ? (of ?)
4304 Lockton, Yorkshire (North Riding)(St Andrew) 2 (of 2)
4305 Loftus, Yorkshire (North Riding)(St Leonard) ? (of 2)
4306 Lythe, Yorkshire (North Riding)(St Oswald) 1 (of 2)
4307 Marrick, Yorkshire (North Riding)(St Andrew) 1 (of 3)
4308 Marske-in-Cleveland, Yorkshire (North Riding)(SS Germain & Mark) 6 (of 6)
4309 Melsonby, Yorkshire (North Riding)(St James the Great) 2 (of 4)
4310 Middleton Tyas, Yorkshire (North Riding)(St Michael) 2 (of 3)
4311 Muker, Yorkshire (North Riding)(St Mary) 1 (of 2)
4312 Muker, Yorkshire (North Riding)(St Mary) 2 (of 2)
4313 Newton-on-Ouse, Yorkshire (North Riding)(All Saints) 3 (of 3)
4314 Osmotherley, Yorkshire (North Riding)(St Peter) 2 (of 3)
4315 Over Silton, Yorkshire (North Riding)(St Mary) 1 (of 1)
4316 Patrick Brompton, Yorkshire (North Riding)(St Patrick) 1 (of 3)
4317 Raskelf, Yorkshire (North Riding)(St Mary the Virgin) 1 (of 3)
4318 Richmond, Yorkshire (North Riding)(The Holy Trinity) 1 (of 1)
4319 Richmond, Yorkshire (North Riding)(St Mary) 6 (of 8)
4320 Rokeby, Yorkshire (North Riding)(St Mary the Virgin) 1 (of 1)
4321 Roxby, Yorkshire (North Riding)(St Nicholas) ? (of 2)
4322 Rudby-in-Cleveland, Yorkshire (North Riding)(All Saints) 3 (of 4)
4323 Salton, Yorkshire (North Riding)(St John of Beverley) 2 (of 2)
4324 Scawton, Yorkshire (North Riding)(St Mary) 1 (of 2)
4325 Scrayingham, Yorkshire (North Riding)(SS Peter & Paul) 1 (of 2)
4326 Scrayingham, Yorkshire (North Riding)(SS Peter & Paul) 2 (of 2)
4327 Scruton, Yorkshire (North Riding)(St Radegund) 3 (of 3)
4328 Seamer by Stokesley, Yorkshire (North Riding)(St Martin) 2 (of 2)
4329 Sessay, Yorkshire (North Riding)(St Cuthbert) 2 (of 3)
4330 Sessay, Yorkshire (North Riding)(St Cuthbert) 1 (of 3)
4331 Sessay, Yorkshire (North Riding)(St Cuthbert) 3 (of 3)
4332 Sinnington, Yorkshire (North Riding)(All Saints) 3 (of 3)
4333 Skelton-in-Cleveland, Yorkshire (North Riding)(All Saints) 1 (of 2)
4334 Skelton-in-Cleveland, Yorkshire (North Riding)(All Saints) 2 (of 2)
4335 Sneaton, Yorkshire (North Riding)(St Hilda) 1 (of 3)
4336 Sockburn, Yorkshire (North Riding)(All Saints) 2 (of 2)
4337 South Kilvington, Yorkshire (North Riding)(St Wilfrid) 2 (of 2)
4338 Stainton-in-Cleveland, Yorkshire (North Riding)(SS Peter & Paul) 1 (of 3)
4339 Stillington, Yorkshire (North Riding)(St Nicholas) 2 (of 3)
4340 Stonegrave, Yorkshire (North Riding)(The Holy Trinity) 3 (of 3)
4341 Strensall, Yorkshire (North Riding)(St Mary) ? (of 3)
4344 Terrington, Yorkshire (North Riding)(All Saints) 3 (of 3)
4345 Terrington, Yorkshire (North Riding)(All Saints) Disused (of 3)
4346 Thirsk, Yorkshire (North Riding)(St Mary the Virgin) 8 (of 8)
4347 Thormanby, Yorkshire (North Riding)(St Mary the Virgin) 1 (of 2)
4348 Wensley, Yorkshire (North Riding)(The Holy Trinity) 3 (of 3)
4349 West Gilling, Yorkshire (North Riding)(St Agatha) 2 (of 3)
4350 West Witton, Yorkshire (North Riding)(St Bartholomew) ? (of ?)
4351 West Witton, Yorkshire (North Riding)(St Bartholomew) ? (of ?)

4352 Whenby, Yorkshire (North Riding)(St Martin) 3 (of 3)
4353 Whorlton, Yorkshire (North Riding)(Holy Cross) 1 (of 1)
4354 Wiggington, Yorkshire (North Riding)(St Nicholas) 2 (of 2)
4355 Wilton by Redcar, Yorkshire (North Riding)(St Cuthbert) 1 (of 2)
4356 Wilton by Redcar, Yorkshire (North Riding)(St Cuthbert) 2 (of 2)
4357 Wilton-Juxta-Ellerburne, Yorkshire (North Riding)(St George) 1 (of 1)
4358 Wilton-Juxta-Ellerburne, Yorkshire (North Riding)(St George) Disused (of 1)
4359 Alburgh, Norfolk (All Saints) 1 (of 4)
4360 Alburgh, Norfolk (All Saints) 3 (of 4)
4361 Alby, Norfolk (St Ethelbert) 3 (of 3)
4362 Alderford, Norfolk (St John the Baptist) ? (of 3)
4363 Anmer, Norfolk (Blessed Virgin Mary) 1 (of 2)
4364 Ashby, Norfolk (Blessed Virgin Mary) 3 (of 3)
4365 Ashmanhaugh, Norfolk (St Swithin) 1 (of 1)
4366 Babingley, Norfolk (St Felix) 1 (of 1)
4367 Bale, Norfolk (All Saints) 2 (of 3)
4368 Banham, Norfolk (Blessed Virgin Mary) 1 (of 5)
4369 Banham, Norfolk (Blessed Virgin Mary) 2 (of 5)
4370 Banham, Norfolk (Blessed Virgin Mary) 3 (of 5)
4371 Banham, Norfolk (Blessed Virgin Mary) 4 (of 5)
4372 Banningham, Norfolk (St Botolph) ? (of 3)
4373 Banningham, Norfolk (St Botolph) ? (of 3)
4374 Barford, Norfolk (St Botolph) 2 (of 3)
4375 Barford, Norfolk (St Botolph) 3 (of 3)
4376 Barnham Broom, Norfolk (SS Peter & Paul) 3 (of 5)
4377 Barnham Broom, Norfolk (SS Peter & Paul) 4 (of 5)
4378 Barningham Northwood, Norfolk (St Peter) 1 (of 2)
4379 Bedingham, Norfolk (St Andrew) 4 (of 4)
4380 Beechamwell, Norfolk (All Saints) 1 (of ?)
4381 Beechamwell, Norfolk (All Saints) ? (of ?)
4382 Beechamwell, Norfolk (All Saints) ? (of ?)
4383 Bessingham, Norfolk (Blessed Virgin Mary) 2 (of 2)
4384 Besthorpe, Norfolk (All Saints) 4 (of 5)
4385 Bexwell, Norfolk (Blessed Virgin Mary) 1 (of 1)
4386 Billingford near Elmham, Norfolk (St Peter) 1 (of 1)
4387 Bintry, Norfolk (St Swithin) 1 (of 3)
4388 Bintry, Norfolk (St Swithin) 2 (of 3)
4389 Bintry, Norfolk (St Swithin) 3 (of 3)
4390 Bixley, Norfolk (St Wandragesilius) ? (of 2)
4391 Blofield, Norfolk (St Andrew) 5 (of 6)
4392 Blo Norton, Norfolk (St Andrew) 1 (of 3)
4393 Blo Norton, Norfolk (St Andrew) 2 (of 3)
4394 Blo Norton, Norfolk (St Andrew) 3 (of 3)
4395 Brampton, Norfolk (St Peter) 1 (of 1)
4396 Brandon Parva, Norfolk (All Saints) 1 (of 3)
4397 Brandon Parva, Norfolk (All Saints) 2 (of 3)
4398 Brandon Parva, Norfolk (All Saints) 3 (of 3)
4399 Braydeston, Norfolk (St Michael) ? (of 3)
4400 Breccles Magna, Norfolk (St Margaret) 2 (of 2)
4401 Bressingham, Norfolk (St John the Baptist) 1 (of 5)
4402 Bressingham, Norfolk (St John the Baptist) 2 (of 5)
4403 Bressingham, Norfolk (St John the Baptist) 3 (of 5)
4404 Brockdish, Norfolk (SS Peter & Paul) 4 (of 5)
4405 Brockdish, Norfolk (SS Peter & Paul) 5 (of 5)
4406 Brockdish, Norfolk (SS Peter & Paul) Clockbell (of 5)
4407 Brooke, Norfolk (St Peter) 4 (of 6)
4408 Brumstead, Norfolk (St Peter) 1 (of 3)
4410 Bergh Apton, Norfolk (SS Peter & Paul) 6 (of 6)
4411 Burgh near Aylsham, Norfolk (Blessed Virgin Mary) 1 (of 1)
4412 Burnham Deepdale, Norfolk (Blessed Virgin Mary) 1 (of 1)
4413 Burnham Norton, Norfolk (St Margaret) 1 (of 1)
4414 Burnham Overy, Norfolk (St Clement) 1 (of 1)
4415 Burston, Norfolk (Blessed Virgin Mary) ? (of 5)
4416 Caistor by Norwich, Norfolk (St Edmund) 3 (of 3)
4417 Carbrooke, Norfolk (SS Peter & Paul) 3 (of 5)
4418 Carbrooke, Norfolk (SS Peter & Paul) 4 (of 5)
4419 Colkirk, Norfolk (Blessed Virgin Mary) 5 (of 5)
4420 Colney, Norfolk (St Andrew) 1 (of 2)
4421 Colney, Norfolk (St Andrew) 2 (of 2)
4422 Colton, Norfolk (St Andrew) 3 (of 3)
4423 Corpusty, Norfolk (St Peter) ? (of 3)
4424 Costessey, Norfolk (St Edward, King & Martyr) 3 (of 5)
4425 Cranworth, Norfolk (Blessed Virgin Mary) 1 (of 3)
4426 Cringleford, Norfolk (St Peter) 2 (of 3)
4427 Cromer, Norfolk (SS Peter & Paul) ? (of 5)
4428 Crostwight, Norfolk (All Saints) ? (of 3)
4429 Croxton near Thetford, Norfolk (All Saints) ? (of 3)

4430 Denton, Norfolk (Blessed Virgin Mary) 2 (of 3)
4431 Denton, Norfolk (Blessed Virgin Mary) 3 (of 3)
4432 Deopham, Norfolk (St Andrew) 5 (of 5)
4433 Dickleburgh, Norfolk (All Saints) 1 (of 4)
4434 Dickleburgh, Norfolk (All Saints) 2 (of 4)
4435 Dickleburgh, Norfolk (All Saints) 3 (of 4)
4436 Didlington, Norfolk (St Michael) ? (of 3)
4437 Diss, Norfolk (St Mary the Virgin) 3 (of 8)
4438 Diss, Norfolk (St Mary the Virgin) 7 (of 8)
4439 Diss, Norfolk (St Mary the Virgin) Sanctus bell (of 8)
4440 Ditchingham, Norfolk (St Mary the Virgin) 2 (of 5)
4441 Ditchingham, Norfolk (St Mary the Virgin) 3 (of 5)
4442 Drayton, Norfolk (St Margaret) 3 (of 3)
4443 Earsham, Norfolk (All Saints) 1 (of 3)
4444 East Barsham, Norfolk (All Saints) 1 (of 1)
4445 East Bradenham, Norfolk (Blessed Virgin Mary) ? (of 3)
4446 East Dereham, Norfolk (St Nicholas) Sanctus bell (of 8)
4447 East Harling, Norfolk (SS Peter & Paul) 6 (of 6)
4448 East Lexham, Norfolk (St Andrew) 1 (of 1)
4449 East Wretham, Norfolk (St Edmund the King) 1 (of 1)
4450 Eaton, Norfolk (St Andrew) 1 (of 3)
4451 Eaton, Norfolk (St Andrew) 2 (of 3)
4452 Eaton, Norfolk (St Andrew) 3 (of 3)
4453 Eccles, Norfolk (Blessed Virgin Mary) 1 (of 3)
4454 Eccles, Norfolk (Blessed Virgin Mary) 2 (of 3)
4455 Edingthorpe, Norfolk (All Saints) 2 (of 3)
4456 Ellingham near Bungay, Norfolk (St Mary the Virgin) 1 (of 5)
4457 Erpingham, Norfolk (Blessed Virgin Mary) 4 (of 4)
4458 Feltwell, Norfolk (St Nicholas) 3 (of 5)
4459 Feltwell, Norfolk (St Nicholas) 4 (of 5)
4460 Fincham, Norfolk (St Martin) 1 (of 4)
4461 Fincham, Norfolk (St Martin) 4 (of 4)
4462 Fordham, Norfolk (Blessed Virgin Mary) 1 (of 1)
4463 Forncett St Mary, Norfolk (St Mary the Virgin) 3 (of 3)
4464 Foulsham, Norfolk (Holy Innocents) 1 (of 1)
4465 Framingham Earl, Norfolk (St Andrew) 1 (of 1)
4466 Freethorpe, Norfolk (All Saints) 1 (of 1)
4467 Frettenham, Norfolk (St Swithin) 1 (of 2)
4468 Frettenham, Norfolk (St Swithin) 2 (of 2)
4469 Fring, Norfolk (All Saints) 1 (of 1)
4470 Fritton, Norfolk (St Katherine) 2 (of 3)
4471 Fritton, Norfolk (St Katherine) 3 (of 3)
4472 Fundenhall, Norfolk (St Nicholas) 1 (of 3)
4473 Fundenhall, Norfolk (St Nicholas) 2 (of 3)
4474 Garboldisham, Norfolk (All Saints) 1 (of 5)
4475 Garboldisham, Norfolk (St John the Baptist) 2 (of 6)
4476 Garboldisham, Norfolk (St John the Baptist) 3 (of 6)
4477 Norwich, Norfolk (St Mary Coslany) Sanctus bell (of 6)
4478 Garboldisham, Norfolk (St John the Baptist) 6 (of 6)
4479 Garveston, Norfolk (St Margaret) 3 (of 3)
4480 Gately, Norfolk (St Helen) 1 (of 3)
4481 Gayton Thorpe, Norfolk (Blessed Virgin Mary) 2 (of 2)
4482 Guist, Norfolk (St Andrew) 1 (of 1)
4483 Guestwick, Norfolk (St Peter) ? (of 3)
4484 Geldeston, Norfolk (St Michael & All Angels) 3 (of 3)
4485 Gillingham, Norfolk (Blessed Virgin Mary) 3 (of 3)
4486 Gimmingham, Norfolk (Blessed Virgin Mary) 1 (of 3)
4487 Great Plumstead, Norfolk (Blessed Virgin Mary) 2 (of 3)
4488 Great Plumstead, Norfolk (Blessed Virgin Mary) 3 (of 3)
4489 Great Snoring, Norfolk (Blessed Virgin Mary) 1 (of 1)
4490 Great Walsingham, Norfolk (St Peter) 1 (of 3)
4491 Great Walsingham, Norfolk (St Peter) 2 (of 3)
4492 Great Walsingham, Norfolk (St Peter) 3 (of 3)
4493 Griston, Norfolk (SS Peter & Paul) 3 (of 4)
4494 Hackford near Hingham, Norfolk (Blessed Virgin Mary) 1 (of 1)
4495 Hales, Norfolk (St Margaret) 1 (of 2)
4496 Hales, Norfolk (St Margaret) 2 (of 2)
4497 Halvergate, Norfolk (SS Peter & Paul) 5 (of 6)
4498 Halvergate, Norfolk (SS Peter & Paul) 6 (of 6)
4499 Hardley, Norfolk (St Margaret) 3 (of 3)
4500 Hardwick, Norfolk (St Margaret) 1 (of 1)
4501 Hargham, Norfolk (All Saints) 1 (of 3)
4502 Hargham, Norfolk (All Saints) 2 (of 3)
4503 Hargham, Norfolk (All Saints) 3 (of 3)
4504 Harpley, Norfolk (St Lawrence) 2 (of 5)
4505 Hassingham, Norfolk (Blessed Virgin Mary) ? (of 2)
4506 Haveringland, Norfolk (St Peter) 2 (of 3)
4507 Haveringland, Norfolk (St Peter) 3 (of 3)
4508 Heacham, Norfolk (Blessed Virgin Mary) Sanctus bell (of 2)
4509 Hellesdon, Norfolk (Blessed Virgin Mary) 1 (of 1)
4510 Hellington, Norfolk (St John the Baptist) 1 (of 2)

4511 Hempstead by Happisburgh, Norfolk (St Andrew) 2 (of 3)
4512 Hempstead by Happisburgh, Norfolk (St Andrew) 3 (of 3)
4513 Hethel, Norfolk (All Saints) 1 (of 1)
4514 Hickling, Norfolk (All Saints) 1 (of 5)
4515 Hickling, Norfolk (All Saints) 3 (of 5)
4516 Hickling, Norfolk (All Saints) 4 (of 5)
4517 Hickling, Norfolk (All Saints) 5 (of 5)
4518 Hingham, Norfolk (St Andrew) 5 (of 8)
4519 Hingham, Norfolk (St Andrew) Clockbell (of 8)
4520 Houghton In The Dale, Norfolk (St Giles) 1 (of 3)
4521 Illington, Norfolk (St Andrew) 3 (of 3)
4522 Ingham, Norfolk (The Holy Trinity & All Saints) ? (of 5)
4523 Ingworth, Norfolk (St Lawrence) ? (of 2)
4524 Itteringham, Norfolk (Blessed Virgin Mary) 2 (of 3)
4525 Itteringham, Norfolk (Blessed Virgin Mary) ? (of 3)
4526 Kenninghall, Norfolk (Blessed Virgin Mary) 1 (of 5)
4527 Kenninghall, Norfolk (Blessed Virgin Mary) 2 (of 5)
4528 Kenninghall, Norfolk (Blessed Virgin Mary) 3 (of 5)
4529 Kenninghall, Norfolk (Blessed Virgin Mary) 4 (of 5)
4530 Kenninghall, Norfolk (Blessed Virgin Mary) 5 (of 5)
4531 Ketteringham, Norfolk (St Peter) 3 (of 5)
4532 Ketteringham, Norfolk (St Peter) 4 (of 5)
4533 Kirby Bedon, Norfolk (St Andrew) 2 (of 3)
4534 Lakenham, Norfolk (St John the Baptist & All Saints) 2 (of 3)
4535 Larling, Norfolk (St Ethelbert) 1 (of 3)
4536 Larling, Norfolk (St Ethelbert) ? (of 3)
4537 Larling, Norfolk (St Ethelbert) 2 (of 3)
4538 Larling, Norfolk (St Ethelbert) 3 (of 3)
4539 Lessingham, Norfolk (All Saints) 1 (of 3)
4540 Lessingham, Norfolk (All Saints) 2 (of 3)
4541 Lessingham, Norfolk (All Saints) 3 (of 3)
4542 Letheringsett, Norfolk (St Andrew) 3 (of 3)
4543 Little Massingham, Norfolk (St Andrew) 2 (of 3)
4544 Little Ormesby, Norfolk (St Michael) 1 (of 3)
4545 Little Ormesby, Norfolk (St Michael) 2 (of 3)
4546 Long Stratton, Norfolk (St Mary) 3 (of 5)
4547 Long Stratton, Norfolk (St Mary) 5 (of 5)
4548 Long Stratton, Norfolk (St Mary) Clockbell (of 5)
4549 Lyng, Norfolk (St Margaret) 4 (of 5)
4550 Lyng, Norfolk (St Margaret) 5 (of 5)
4551 Lynn, Norfolk (St Margaret) ? (of 5)?
4552 Lynn, Norfolk (St Margaret) ? (of ?)
4553 Lynn, Norfolk (St Margaret) 5? (of 5)
4554 Martham, Norfolk (Blessed Virgin Mary) 5 (of 6)
4555 Martham, Norfolk (Blessed Virgin Mary) 6 (of 6)
4556 Matlaske, Norfolk (St Peter) 2 (of 3)
4557 Mattishall, Norfolk (All Saints) Clockbell (of 6)
4558 Mautby, Norfolk (SS Peter & Paul) 1 (of 1)
4559 Melton Constable, Norfolk (St Peter) 2 (of 3)
4560 Melton Magna, Norfolk (Blessed Virgin Mary) 3 (of 3)
4561 Melton Parva, Norfolk (All Saints) 1 (of 3)
4562 Melton Parva, Norfolk (All Saints) 2 (of 3)
4563 Metfield, Suffolk (St John the Baptist) 3 (of 3)
4564 Metton, Norfolk (St Andrew) 1 (of 2)
4565 Metton, Norfolk (St Andrew) 2 (of 2)
4566 Monks Toft, Norfolk (St Margaret) 2 (of 3)
4567 Monks Toft, Norfolk (St Margaret) 3 (of 3)
4568 Morley, Norfolk (St Botolph) 2 (of 3)
4569 Morley, Norfolk (St Botolph) 3 (of 3)
4570 Moulton by Acre, Norfolk (Blessed Virgin Mary) 1 (of 1)
4571 Mundford, Norfolk (St Leonard) ? (of 3)
4572 Mundham, Norfolk (St Peter) 1 (of 3)
4573 Mundham, Norfolk (St Peter) 2 (of 3)
4574 Mundham, Norfolk (St Peter) 3 (of 3)
4575 Narford, Norfolk (Blessed Virgin Mary) ? (of 3)
4576 Needham, Norfolk (St Peter) 2 (of 3)
4577 New Houghton, Norfolk (St Martin) 1 (of 1)
4578 Newton by Castleacre, Norfolk (St Mary & All Saints) 1 (of 1)
4579 North Burlingham, Norfolk (St Andrew) 1 (of 3)
4580 North Burlingham, Norfolk (St Andrew) 2 (of 3)
4581 North Burlingham, Norfolk (St Andrew) 3 (of 3)
4582 North Burlingham, Norfolk (St Peter) 1 (of 3)
4583 North Burlingham, Norfolk (St Peter) 2 (of 3)
4584 North Burlingham, Norfolk (St Peter) 3 (of 3)
4585 North Lopham, Norfolk (St Andrew) ? (of 4)
4586 North Repps, Norfolk (Blessed Virgin Mary) 2 (of 5)
4587 North Tuddenham, Norfolk (Blessed Virgin Mary) 1 (of 1)
4588 Norwich, Norfolk (All Saints) 2 (of 3)
4589 Norwich, Norfolk (All Saints) 3 (of 3)
4590 Norwich, Norfolk (The Holy Trinity) 1 (of 5)
4591 Norwich, Norfolk (The Holy Trinity) 2 (of 5)

4592 Norwich, Norfolk (The Holy Trinity) 4 (of 5)
4593 Norwich, Norfolk (The Holy Trinity) 5 (of 5)
4595 Norwich, Norfolk (St Clement) 2 (of 3)
4596 Norwich, Norfolk (St Clement) 3 (of 3)
4597 Norwich, Norfolk (St Edmund) 4 (of 5)
4598 Norwich, Norfolk (St George Colegate) 2 (of 3)
4599 Norwich, Norfolk (St George Colegate) 3 (of 3)
4600 Norwich, Norfolk (St George Tombland) 1 (of 5)
4601 Norwich, Norfolk (St George Tombland) 2 (of 5)
4602 Norwich, Norfolk (St George Tombland) 3 (of 5)
4603 Norwich, Norfolk (St George Tombland) 4 (of 5)
4604 Norwich, Norfolk (St Giles) 5 (of 8)
4605 Norwich, Norfolk (St Giles) 6 (of 8)
4606 Norwich, Norfolk (St Giles) 7 (of 8)
4607 Norwich, Norfolk (St Giles) 8 (of 8)
4608 Norwich, Norfolk (St Gregory) 1 (of 5)
4609 Norwich, Norfolk (St Gregory) 2 (of 5)
4610 Norwich, Norfolk (St Gregory) 3 (of 5)
4611 Norwich, Norfolk (St Gregory) 4 (of 5)
4612 Norwich, Norfolk (St Gregory) 5 (of 5)
4613 Norwich, Norfolk (St John Maddermarket) ? (of 5)
4614 Norwich, Norfolk (St John Maddermarket) ? (of 5)
4615 Norwich, Norfolk (St John Maddermarket) ? (of 5)
4616 Norwich, Norfolk (St John Sepulchre) 3 (of 5)
4617 Norwich, Norfolk (St John Sepulchre) 5 (of 5)
4618 Norwich, Norfolk (St Julian) 1 (of 1)
4619 Norwich, Norfolk (St Lawrence) 3 (of 6)
4620 Norwich, Norfolk (St Lawrence) 5 (of 6)
4621 Norwich, Norfolk (St Mary Coslany) 5 (of 6)
4622 Norwich, Norfolk (St Mary Coslany) 6 (of 6)
4623 Norwich, Norfolk (St Michael At Thorm) 2 (of 3)
4624 Rockland Tofts, Norfolk (All Saints) 2 (of 3)
4625 Norwich, Norfolk (St Michael Coslany) 5 (of 8)
4626 Norwich, Norfolk (St Michael Coslany) 7 (of 8)
4627 Norwich, Norfolk (St Michael Coslany) 8 (of 8)
4628 Norwich, Norfolk (St Paul) 3 (of 3)
4629 Norwich, Norfolk (St Paul) 1 (of 3)
4630 Norwich, Norfolk (St Paul) 2 (of 3)
4631 Norwich, Norfolk (St Peter Hungate) 1 (of 3)
4632 Norwich, Norfolk (St Peter Mancroft) 4 (of 8)
4633 Norwich, Norfolk (St Peter Mancroft) 5 (of 8)
4634 Norwich, Norfolk (St Peter Mancroft) 6 (of 8)
4635 Norwich, Norfolk (St Peter Mancroft) 7 (of 8)
4636 Norwich, Norfolk (St Peter Permountergate) 3 (of 5)
4637 Norwich, Norfolk (St Peter Permountergate) 4 (of 5)
4638 Norwich, Norfolk (SS Simon & Jude) 1 (of 5)
4639 Norwich, Norfolk (St Stephen) 3 (of 5)
4640 Norwich, Norfolk (St Stephen) 5 (of 5)
4641 Norwich, Norfolk (St Swithin) 2 (of 3)
4642 Norwich, Norfolk (St Swithin) 3 (of 3)
4643 Plumstead by Holt, Norfolk (St Michael) 1 (of 1)
4644 Poringland, Norfolk (All Saints) 1 (of 1)
4645 Potter Heigham, Norfolk (St Nicholas) 2 (of 3)
4646 Potter Heigham, Norfolk (St Nicholas) 3 (of 3)
4647 Pulham, Norfolk (St Mary the Virgin) 4 (of 6)
4648 Pulham, Norfolk (St Mary the Virgin) 5 (of 6)
4649 Quidenham, Norfolk (St Andrew) 1 (of 3)
4650 Quidenham, Norfolk (St Andrew) 2 (of 3)
4651 Ranworth, Norfolk (St Helen) 4 (of 5)
4652 Raveningham, Norfolk (St Andrew) 1 (of 3)
4653 Redenhall, Norfolk (Assumption of the Blessed Virgin Mary) 6 (of 6)
4654 Redenhall, Norfolk (Assumption of the Blessed Virgin Mary) 4 (of 6)
4655 Barton Bendish, Norfolk (All Saints) ? (of ?)
4656 Barton Bendish, Norfolk (All Saints) ? (of ?)
4657 Barton Bendish, Norfolk (All Saints) ? (of ?)
4658 Reymerstone, Norfolk (St Peter) 5 (of 5)
4659 Ringland, Norfolk (St Peter) 5 (of 5)
4660 Ringland, Norfolk (St Peter) 4 (of 5)
4661 Wood Rising, Norfolk (St Nicholas) 2 (of 2)
4662 Rockland Tofts, Norfolk (St Peter) 1 (of 1)
4663 Rockland Tofts, Norfolk (All Saints) 3 (of 3)
4664 Rollesby, Norfolk (St George) 1 (of 3)
4665 Rollesby, Norfolk (St George) 2 (of 3)
4666 Rougham, Norfolk (Blessed Virgin Mary) ? (of 2)
4667 Rowdham, Norfolk (St Andrew) ? (of 2)
4668 Roydon near Diss, Norfolk (St Remigius) ? (of 4)
4669 Runhall, Norfolk (All Saints) ? (of 3)
4670 Salhouse, Norfolk (All Saints) 2 (of 2)
4671 Salle, Norfolk (SS Peter & Paul) 3 (of 6)
4672 Salle, Norfolk (SS Peter & Paul) 5 (of 6)
4673 Scarning, Norfolk (SS Peter & Paul) Sanctus bell (of 5)

4674 Shereford, Norfolk (St Nicholas) 1 (of 1)
4675 Shimpling, Norfolk (St George) ? (of 4)
4676 Shimpling, Norfolk (St George) ? (of 4)
4677 Shipdham, Norfolk (All Saints) Clockbell (of ?)
4678 Shotesham, Norfolk (All Saints) 3 (of 5)
4679 Shotesham, Norfolk (All Saints) 4 (of 5)
4680 Snettisham, Norfolk (Blessed Virgin Mary) Disused (of 6)
4681 South Acre, Norfolk (St George) 2 (of 3)
4682 South Burgh, Norfolk (St Andrew) 1 (of 2)
4683 South Burlingham, Norfolk (St Edmund) 3 (of 3)
4684 South Lopham, Norfolk (St Nicholas) 2 (of 6)
4685 South Lopham, Norfolk (St Nicholas) 3 (of 6)
4686 South Lopham, Norfolk (St Nicholas) 5 (of 6)
4687 Thorpe Market, Norfolk (St Margaret) ? (of ?)
4688 South Walsham, Norfolk (St Mary) 5 (of 5)
4689 Spixworth, Norfolk (St Peter) 1 (of 2)
4690 Spixworth, Norfolk (St Peter) 2 (of 2)
4691 Sprowston, Norfolk (St Margaret) 3 (of 3)
4692 Stanfield, Norfolk (St Margaret) 2 (of 4)
4693 Stanfield, Norfolk (St Margaret) 4 (of 4)
4694 Starston, Norfolk (St Margaret) 5 (of 5)
4695 Stibbard, Norfolk (All Saints) 3 (of 3)
4696 Stiffkey, Norfolk (St Mary) 1 (of 1)
4697 Stockton, Norfolk (St Michael & All Angels) 2 (of 4)
4698 Stockton, Norfolk (St Michael & All Angels) 4 (of 4)
4699 Stodey, Norfolk (Blessed Virgin Mary) 1 (of 1)
4700 Stoke, Norfolk (Holy Cross) 1 (of 3)
4701 Strumpshaw, Norfolk (St Peter) 1 (of 3)
4702 Strumpshaw, Norfolk (St Peter) 3 (of 3)
4703 Surlingham, Norfolk (St Mary the Virgin) 3 (of 4)
4704 Surlingham, Norfolk (St Mary the Virgin) 4 (of 4)
4705 Sustead, Norfolk (SS Peter & Paul) 1 (of 2)
4706 Sutton, Norfolk (St Michael) 2 (of 3)
4707 Sutton, Norfolk (St Michael) 3 (of 3)
4708 Swafield, Norfolk (St Nicholas) 3 (of 4)
4709 Swardeston, Norfolk (St Andrew) 4 (of 4)
4710 Tharston, Norfolk (St Mary the Virgin) 3 (of 4)
4711 Tharston, Norfolk (St Mary the Virgin) 4 (of 4)
4712 Themelthorpe, Norfolk (St Andrew) 1 (of 1)
4713 Thetford, Norfolk (St Mary) 6 (of 6)?
4714 Thetford, Norfolk (SS Peter & Andrew) 6 (of 6)
4715 Thornage, Norfolk (All Saints) 1 (of 1)
4716 Thorpe Next Haddiscoe, Norfolk (St Matthias) 2 (of 2)
4717 Thurton, Norfolk (St Ethelbert) 2 (of 3)
4718 Threxton, Norfolk (All Saints) 1 (of 1)
4719 Thrigby, Norfolk (St Margaret) 1 (of 1)
4720 Thurne, Norfolk (St Edmund) 1 (of 1)
4721 Thwaithe St Mary, Norfolk (St Mary the Virgin) 1 (of 2)
4722 Thwaite near Aylsham, Norfolk (All Saints) 1 (of 1)
4723 Tivetshall, Norfolk (St Margaret) 4 (of 5)
4724 Tivetshall, Norfolk (St Mary) 4 (of 4)
4725 Trimmingham, Norfolk (St John the Baptist) 1 (of 1)
4726 Trunch, Norfolk (St Botolph) 3 (of 4)
4727 Upton, Norfolk (St Margaret) ? (of 4)
4728 Wacton Magna, Norfolk (All Saints) 2 (of 3)
4729 Wacton Magna, Norfolk (All Saints) 3 (of 3)
4730 Watlington, Norfolk (SS Peter & Paul) 4 (of 5)
4731 Watlington, Norfolk (SS Peter & Paul) 5 (of 5)
4732 Watton, Norfolk (Blessed Virgin Mary) 1 (of 3)
4733 Weasenham, Norfolk (St Peter) 2 (of 3)
4734 Welborne, Norfolk (All Saints) 1 (of 1)
4735 Wellingham, Norfolk (St Andrew) 1 (of 1)
4736 Wendling, Norfolk (SS Peter & Paul) 2 (of 3)
4737 Wendling, Norfolk (SS Peter & Paul) 3 (of 3)
4738 West Bradenham, Norfolk (St Andrew) 2 (of 3)
4739 West Harling, Norfolk (All Saints) 3 (of 3)
4740 West Lynn, Norfolk (St Peter) 1 (of 1)
4741 West Newton, Norfolk (SS Peter & Paul) 1 (of 1)
4742 Weston Longville, Norfolk (All Saints) 3 (of 5)
4743 Weston Longville, Norfolk (All Saints) 5 (of 5)
4744 West Rudham, Norfolk (St Peter) 1 (of 3)
4745 West Somerton, Norfolk (Blessed Virgin Mary) 1 (of 1)
4746 West Toft, Norfolk (Blessed Virgin Mary) 4 (of 4)
4747 West Winch, Norfolk (Blessed Virgin Mary) 2 (of 3)
4748 West Winch, Norfolk (Blessed Virgin Mary) 3 (of 3)
4749 Whinbergh, Norfolk (Blessed Virgin Mary) 1 (of 2)
4750 Wicklewood, Norfolk (All Saints) 2 (of 2)
4751 Wiggenhall, Norfolk (St German) 1 (of 4)
4752 Wimbotsham, Norfolk (Blessed Virgin Mary) 1 (of 3)
4753 Wimbotsham, Norfolk (Blessed Virgin Mary) 2 (of 3)
4754 Witton near North Walsham, Norfolk (St Margaret) 1 (of 1)
4755 Wolterton, Norfolk (St Margaret) ? (of 2)

4756 Wood Bastwick, Norfolk (SS Fabian & Sebastian) 2 (of 2)
4757 Wramplingham, Norfolk (SS Peter & Paul) 2 (of 3)
4758 Wramplingham, Norfolk (SS Peter & Paul) 1 (of 3)
4759 Wreningham, Norfolk (Blessed Virgin Mary) 3 (of 4)
4760 Wretton, Norfolk (All Saints) 1 (of 2)
4761 Wretton, Norfolk (All Saints) 2 (of 2)
4762 Wood Rising, Norfolk (St Nicholas) 1 (of 2)
4763 Arnold, Nottinghamshire (St Mary) 1 (of 3)
4764 Blyth, Nottinghamshire (SS Mary & Martin) 3 (of 4)
4765 Dummer, Hampshire (All Saints) Sanctus bell (of 5)
4766 Wellow, Nottinghamshire (St Swithin) 3 (of 3)
4767 Weston, Nottinghamshire (All Saints) 3 (of 3)
4768 Ecclesfield, Yorkshire (West Riding)(St Mary the Virgin) Sanctus bell (of 8)
4769 Hooton Pagnell, Yorkshire (West Riding)(All Saints) 2 (of 3)
4770 Kimberworth, Yorkshire (West Riding)(St Thomas) 1 (of 2)
4771 Sharlston, Yorkshire (West Riding)(St Luke) 2 (of 2)
4772 Woodkirk, Yorkshire (West Riding)(St Mary) 1 (of 3)
4773 Hartshorne, Derbyshire (St Peter) 5 (of 5)
4774 Heanor, Derbyshire (St Lawrence) 3 (of 5)
4775 Norwich, Norfolk (St Saviour) 1 (of 1)
4777 West Knowle, Somerset (St Giles) 2 (of 2)
4778 Woolwich, Kent (St Mary) 1 (of 1)
4779 Westbury-on-Trym, Gloucestershire (The Holy Trinity) Angelus (of ?)
4780 Chilton, Somerset (The Holy Trinity) 1 (of 4)
4781 Chilton, Somerset (The Holy Trinity) ? (of 4)
4782 Little Barford, Bedfordshire (St Deny Or St Mary) 3 (of 4)
4783 Richard's Castle, Herefordshire (St Bartholomew) 3 (of 3)
4784 Stowe, Lincolnshire (St Michael) 1 (of 1)
4785 Rayne, Essex (All Saints) Sackring bell (of 4)
4786 Grasby, Lincolnshire (All Saints) ? (of 4)
4788 Tankersley, Yorkshire (West Riding)(St Peter) 3 (of 3)
4789 Owston, Yorkshire (West Riding)(All Saints) 3 (of 3)
4790 Dronfield, Derbyshire (St John the Baptist) 4 (of 6)
4791 Youlgreave, Derbyshire (All Saints) 5 (of 5)
4792 Osmaston, Derbyshire (St Martin) ? (of ?)
4793 Pinxton, Derbyshire (St Helen) 1 (of 2)
4794 Stanton by Bridge, Derbyshire (St Michael) ? (of 2)
4795 Taxal, Derbyshire (St James) 2 (of 6)
4796 West Hallam, Derbyshire (St Wilfrid) 3 (of 6)
4797 Taxal, Derbyshire (St James) 1 (of 6)

APPENDIX 3
INCIDENCE MATRIX OF BELLS AND STAMPS

The bells are listed in Appendix 2 and the stamps are illustrated in Appendix 1.

```
0001 3.0003 3.0012 3.0016 3.0017 3.0083
0002 1.0007 3.0015
0003 1.0036 3.0015
0004 3.0004
0005 1.0038 7.0008 7.0020 8.0005
0006 1.0038 7.0008
0007 1.0005 8.0056
0009 1.0001 1.0035 3.0003 3.0004 8.0056
0011 1.0110
0012 1.0034 1.0043 3.0007 8.0002
0013 1.0005 1.0006 3.0013
0014 1.0007 1.0036
0016 1.0005 1.0006 3.0005 7.0016
0017 1.0005 1.0006 3.0005 7.0016
0018 1.0005 1.0006 3.0005 7.0016
0021 1.0105
0025 1.0038 3.0018 7.0008 7.0020 8.0005
0027 1.0038 7.0008
0028 3.0011 8.0034
0030 1.0105
0032 1.0038 3.0018 7.0008 8.0005
0034 1.0007 3.0009
0035 1.0105
0036 1.0033 7.0003
0037 1.0033
0039 1.0001 3.0006 7.0016 8.0056
0040 1.0005 1.0006 3.0005 7.0016 8.0056
0041 1.0001 1.0035 3.0003 3.0004 8.0056
0042 1.0001 3.0001 3.0002 8.0056
0043 1.0001 3.0001 3.0002 8.0056
0044 1.0001 3.0001 3.0002 8.0056
0048 7.0008 7.0014 7.0020
0049 1.0039 5.0001 7.0008 8.0005
0050 7.0008 7.0014 7.0020
0051 1.0104 5.0001 8.0003 8.0005
0053 7.0008 7.0014
0056 1.0039 5.0001 7.0008 8.0005
0057 1.0109 2.0053 8.0043
0058 1.0039 7.0008 7.0020 8.0005
0059 8.0054
0060 1.0039 5.0001 7.0008 7.0020 8.0005
0061 8.0047
0062 1.0002 1.0039 3.0086 7.0008 7.0020 8.0005
0063 7.0008 7.0014 7.0020
0064 7.0008 7.0014 7.0020
0065 1.0039 7.0008 8.0005
0066 2.0005 3.0019 8.0045
0067 3.0020 5.0033
0069 1.0101 8.0036
0070 1.0039 5.0001 7.0008 8.0005
0071 1.0039 5.0001 7.0008 7.0020 8.0005
0073 5.0001 7.0008 7.0020 8.0005
0076 1.0042 2.0002 8.0040
0077 2.0005 3.0019 5.0002
0079 1.0111 8.0050
0080 1.0040 1.0099 1.0100 8.0039
```

```
0081 1.0279 8.0041
0082 8.0257
0083 1.0039 2.0004 7.0008 7.0014 7.0020 8.0005
0085 1.0039 2.0041 7.0008
0087 3.0019
0089 1.0101
0090 1.0005 3.0013 5.0004 8.0018 8.0056
0091 1.0001 3.0005 7.0016
0092 1.0039 7.0008
0093 1.0038 3.0018 3.0021 5.0001 7.0009 7.0020 8.0005
0094 1.0190 2.0069 3.0020 5.0033
0095 1.0038 3.0018 7.0009
0097 3.0019 5.0003
0099 1.0038 3.0018 7.0009 8.0005
0101 8.0057
0102 1.0039 7.0008 7.0020
0103 1.0039 7.0008
0104 1.0036 2.0002 2.0107 8.0002 8.0051
0105 2.0006 7.0008 7.0020 8.0005
0106 2.0006 7.0008 7.0020 8.0005
0107 1.0005 3.0013 8.0056
0108 1.0005 3.0013 8.0056
0110 3.0096 8.0037
0111 1.0280 8.0042
0112 1.0103 1.0132 8.0002 8.0051
0113 1.0033 1.0281 8.0052
0114 8.0046
0115 8.0048
0116 8.0048
0117 3.0001 3.0002 8.0056
0118 1.0001 3.0001 8.0034
0119 1.0004 1.0102 1.0107
0120 3.0082 8.0046
0121 2.0006 3.0020 5.0002
0122 1.0103 2.0001 8.0051
0124 1.0034 3.0007 4.0001 6.0001 8.0051
0125 8.0038
0128 1.0005 3.0005 7.0016 8.0056
0132 2.0007
0133 3.0018 7.0008 7.0020 8.0005
0135 5.0003 8.0008
0136 3.0018 7.0008 7.0020 8.0005
0140 7.0008 7.0020 8.0005
0142 1.0001 3.0003 3.0004 8.0056
0143 7.0015 8.0044
0144 1.0033 7.0002 8.0052
0146 2.0006 3.0020 5.0002
0147 1.0106 1.0131 3.0018 3.0082 7.0009 8.0005 8.0008
0149 3.0018 7.0009 8.0005
0150 7.0008 8.0005
0152 3.0082 8.0046
0153 5.0002
0154 8.0038
0155 8.0048
0156 8.0037
0157 1.0041 3.0007 4.0001 8.0051
0158 1.0105 2.0003 8.0033
0159 1.0005 3.0005 7.0016 8.0056
0161 1.0005 3.0001 3.0002 8.0056
0162 1.0005 3.0001 3.0002 7.0053 8.0056
0166 5.0089 6.0002 8.0035
0167 8.0048
0168 8.0048
```

```
0169 1.0005 3.0013 8.0056
0174 3.0014 7.0001 7.0002 8.0046 8.0211
0175 1.0105 2.0003 8.0033
0176 1.0044 8.0004
0177 7.0008 7.0020 8.0005
0178 7.0008 7.0020 8.0005
0180 1.0105 2.0003 8.0033
0181 3.0018
0182 1.0103 3.0010 8.0051
0184 1.0279 8.0161
0186 8.0055
0188 1.0280 8.0049
0189 3.0009 8.0053
0190 1.0005 3.0013 8.0056
0191 1.0268 8.0259
0197 1.0001 3.0006 7.0016 8.0056
0198 1.0003 3.0006 7.0016 8.0001
0200 1.0127 1.0136 3.0005 7.0017 7.0018
0201 1.0001 3.0001 3.0002
0202 1.0001 3.0001 3.0002
0203 1.0001 3.0001 3.0002
0207 1.0033 1.0038 1.0039 1.0106 3.0082 7.0009 7.0010 7.0020 8.0005
     8.0008
0208 1.0105 2.0115 7.0002
0211 1.0005 1.0046 3.0005 3.0006 5.0010 8.0056
0212 1.0045 7.0001 7.0002 8.0052
0213 1.0003 3.0006 5.0010 7.0035 8.0053
0214 3.0005 7.0016 7.0022
0215 3.0005 7.0016 7.0022
0216 3.0005 7.0016
0217 3.0005 7.0016
0218 3.0090
0222 1.0241 1.0245 1.0269 2.0039 7.0022
0223 1.0187 2.0114 8.0222
0224 1.0187 2.0114 8.0222
0225 1.0105 7.0002 8.0235
0228 1.0187 3.0090
0229 1.0033 2.0115
0230 1.0033 2.0115 7.0002 7.0003 8.0052
0231 2.0114 3.0090
0232 8.0244
0233 1.0187 2.0079 3.0090
0234 1.0306 2.0173 8.0222
0235 1.0009 3.0007 5.0028 8.0055 8.0092
0237 3.0007
0238 3.0090
0244 7.0003 7.0004
0245 7.0003 7.0004
0246 1.0001 3.0006 7.0016
0247 1.0165 8.0247
0249 3.0009
0250 3.0007 4.0001 7.0023 7.0024 7.0025 7.0026 8.0004
0253 3.0090 3.0104 3.0105
0254 3.0005 3.0090
0256 1.0160 3.0091 7.0012 8.0237
0257 1.0105 2.0080
0258 3.0015 7.0020
0259 1.0160 3.0091 5.0023 7.0012 8.0237
0262 3.0021
0263 3.0009
0264 1.0105 2.0080
0265 1.0165 8.0247
0266 1.0002 3.0086 3.0088 4.0001
```

```
0267 3.0012 7.0016
0268 3.0012 7.0016
0269 3.0090
0270 1.0187 3.0090 8.0222
0272 1.0187 3.0090 8.0222
0276 1.0187 3.0090
0277 3.0022 6.0002 7.0020
0278 3.0090
0279 1.0001 3.0006 7.0016
0280 1.0127 1.0136 7.0017 7.0018
0281 1.0187 2.0114 3.0090
0282 3.0007 4.0001
0283 1.0201 3.0044 3.0085 5.0027 7.0078
0284 7.0002
0287 1.0201 3.0044 3.0085 5.0027 7.0078
0291 1.0001 3.0003 8.0056
0292 1.0001 3.0003 8.0056
0296 1.0203 3.0086 3.0088
0297 1.0203 3.0086 3.0088
0298 1.0183
0299 1.0096
0300 3.0012
0301 1.0183
0302 1.0183
0303 1.0008 1.0011
0304 1.0006 3.0012
0305 1.0001 3.0003 3.0004 8.0056
0306 1.0006 3.0012
0308 1.0008 3.0087 3.0088
0309 1.0089 3.0086 3.0088
0311 3.0086 3.0088
0312 1.0183
0313 1.0001 3.0001 3.0002
0314 1.0203
0315 1.0183
0316 1.0182
0317 1.0183 3.0030
0318 1.0203 3.0031
0319 1.0006 3.0001 3.0002
0321 1.0006 1.0035 3.0003 3.0012
0322 1.0001 1.0006 1.0035 3.0003 3.0004 8.0056
0325 1.0203
0326 1.0001 3.0001 3.0002
0327 1.0182 3.0031
0328 1.0096
0329 1.0183
0330 1.0182
0331 1.0182
0332 1.0006 3.0005 7.0016
0333 3.0030
0334 1.0183
0335 1.0183 3.0059
0336 1.0182
0337 3.0009
0338 1.0010
0339 1.0089
0341 1.0163 2.0073 2.0078
0342 1.0096
0344 1.0163
0345 1.0163
0346 3.0086
0347 1.0096
0348 1.0096
```

```
0350 8.0193
0354 8.0193
0355 8.0193
0356 8.0171
0357 8.0106
0359 1.0049 2.0030 6.0031 8.0188
0360 1.0049 1.0050 2.0030 2.0031 8.0104 8.0188
0361 1.0051 3.0024 3.0079 5.0018 8.0175
0364 1.0277 5.0042
0365 1.0092 3.0081 8.0215
0366 1.0172 2.0066 2.0158 8.0170
0367 1.0092 8.0215
0373 1.0126 2.0042 5.0014
0374 1.0172 8.0170
0375 1.0126 2.0042 5.0014 8.0105
0376 2.0065 2.0087 7.0073 8.0210
0381 3.0006
0383 8.0194
0388 5.0029
0395 1.0126 2.0042 5.0014
0396 1.0049 2.0030 6.0031 8.0188
0397 1.0049
0402 1.0049 2.0030 6.0031 8.0188
0408 1.0129 2.0067
0411 3.0085 4.0018
0412 3.0085
0414 1.0189
0415 1.0055 3.0025 6.0011
0416 1.0055 3.0036 6.0011
0417 3.0036 6.0011 8.0187
0418 3.0095 5.0020 8.0208
0419 1.0161
0420 1.0188 2.0081 8.0075
0421 1.0068 1.0168
0422 3.0095 5.0020 7.0060 8.0208
0425 3.0078
0427 1.0230
0428 3.0085 4.0002
0429 1.0304
0430 1.0161
0431 3.0095 5.0020 7.0060 8.0208
0432 3.0085
0433 3.0073 3.0074
0435 1.0244 3.0095 7.0060 8.0076
0436 1.0244 8.0076
0437 1.0244 3.0095 8.0076
0438 1.0161
0439 3.0040
0441 3.0078
0442 1.0051 1.0161 6.0015 8.0172
0443 1.0161 1.0191 4.0016 6.0015 8.0172
0444 1.0244 3.0095 8.0076
0445 3.0095 7.0060 8.0171
0446 3.0095 5.0020 7.0060 8.0208
0447 1.0188 1.0230 2.0081 2.0083 8.0075
0448 3.0095 7.0060
0449 1.0305
0450 7.0110
0451 3.0085
0452 1.0033 3.0063 7.0070 7.0071
0453 3.0085
0454 1.0227 3.0091 4.0017 7.0012
0455 1.0174 3.0091 5.0019 7.0002 7.0012 8.0128
```

```
0456 8.0219
0457 1.0058 3.0044
0458 3.0065
0459 3.0025
0460 2.0081 7.0110
0461 1.0055 3.0065 6.0011
0462 1.0051 6.0011 3.0028
0463 1.0168 1.0244 3.0084 7.0061 8.0076
0464 3.0095 7.0060
0466 1.0129 8.0094
0467 3.0025
0468 1.0058 3.0044
0469 1.0188 2.0081 8.0075
0470 3.0085
0471 1.0128 2.0015 8.0240
0472 3.0085
0473 5.0097 7.0055 8.0058
0474 1.0161 1.0191 4.0016
0475 1.0009 3.0095
0476 1.0055
0477 1.0244 3.0095 7.0060 8.0076
0478 1.0242
0479 1.0096
0480 1.0007 1.0085 2.0101 3.0014 8.0113
0481 1.0096
0482 1.0096
0483 1.0098 1.0109 8.0020
0484 1.0013
0485 1.0013 1.0014
0486 1.0096 8.0112
0487 1.0096 8.0112
0488 1.0183 8.0029
0489 1.0098 1.0109 8.0112
0490 1.0098 8.0020 8.0021 8.0029
0491 1.0183
0492 1.0183
0493 1.0182
0494 1.0182 3.0031
0495 3.0031
0496 1.0183
0497 1.0163 4.0015 5.0024
0498 1.0163 4.0015 5.0024
0500 3.0087
0501 1.0030 1.0042 2.0002 3.0086 3.0087 8.0040
0502 1.0203 8.0112
0503 1.0013 1.0014
0504 3.0087
0505 1.0011 1.0013 3.0014
0506 1.0007 1.0011 1.0013 3.0014
0507 1.0183
0508 1.0183
0509 1.0182 3.0031
0510 1.0183
0513 1.0183 3.0030
0514 1.0183
0515 1.0183
0516 1.0096
0517 1.0183
0518 1.0096 3.0031 6.0014
0519 1.0013 1.0014 6.0013
0520 7.0102 8.0227
0521 1.0182 3.0030
0522 1.0182 3.0031 3.0060
```

```
0523 1.0182
0524 3.0030
0526 1.0183 3.0030
0527 4.0015
0528 1.0183 3.0030
0529 6.0014
0530 3.0030 6.0014
0531 1.0183
0532 1.0183
0533 1.0182
0534 1.0203
0535 1.0096
0536 1.0183 3.0059
0537 1.0182 3.0031
0538 1.0203
0539 1.0182
0542 1.0182 3.0031
0544 1.0183
0545 6.0019
0546 1.0182
0547 1.0183
0548 1.0096
0549 1.0183
0550 1.0203
0551 1.0183
0552 1.0183 3.0059
0553 1.0096 3.0031
0554 1.0183
0555 1.0183
0557 1.0096
0558 1.0096 1.0182 3.0059
0559 1.0203
0560 1.0182
0561 1.0203
0562 1.0183
0563 3.0031
0564 3.0088
0565 3.0087
0566 1.0183
0567 1.0183 3.0031
0568 1.0005 1.0035 3.0005 7.0016
0569 1.0182 3.0030
0570 1.0183 3.0030 4.0015
0571 1.0183 3.0030
0572 1.0096 8.0112
0574 1.0182 8.0112
0575 1.0096
0576 1.0183 3.0030
0577 1.0183
0578 1.0183
0580 1.0096
0581 1.0096
0582 1.0182 3.0030
0583 1.0096 3.0031
0584 1.0182 2.0068 3.0030
0585 1.0183
0586 1.0183 3.0030
0589 1.0183
0590 1.0183 3.0030
0591 1.0203
0592 1.0182 3.0031
0593 1.0183 3.0030
0594 1.0182 3.0030
```

```
0595 1.0203
0597 1.0203
0598 1.0203
0599 1.0109 1.0185 8.0112
0600 1.0163 2.0078
0601 1.0183
0602 1.0183
0603 1.0183
0604 1.0096
0605 1.0013 5.0024
0606 1.0013
0607 1.0183
0608 1.0183
0609 1.0182
0610 1.0183
0611 1.0166
0614 1.0096 3.0031
0615 1.0183 3.0030
0616 1.0203 3.0030
0617 1.0096 8.0112
0618 1.0096 2.0101 3.0031
0619 1.0098
0620 1.0096
0621 1.0182 3.0031
0622 1.0183
0623 2.0078
0624 1.0203
0625 1.0182 3.0030
0626 1.0183 8.0112
0627 4.0011 8.0236
0628 1.0183
0629 1.0182
0630 6.0013 7.0102 8.0227
0631 1.0163 4.0013 4.0015
0632 1.0163 4.0015 5.0024
0633 1.0007 3.0008
0634 1.0007 1.0010 1.0036 3.0008 8.0001
0635 1.0182
0636 1.0001 3.0001 3.0002
0638 8.0112
0639 1.0182
0640 1.0182
0641 1.0096
0642 1.0096 8.0112
0643 1.0183
0644 5.0024
0645 2.0153 8.0102
0646 1.0096
0647 1.0183
0648 1.0203
0649 1.0183
0650 1.0183 3.0031
0651 1.0183
0652 1.0183
0653 1.0203
0654 1.0182 3.0030
0655 1.0183
0656 1.0096 3.0031 8.0112
0657 1.0096 2.0101 3.0031
0658 1.0182 3.0030
0659 3.0030
0660 1.0183
0661 1.0183 3.0030
```

```
0662 2.0063 3.0031
0663 1.0182 5.0046
0664 1.0096
0665 1.0182
0666 1.0183 3.0030
0667 1.0183 3.0030
0668 1.0183
0669 1.0183
0670 1.0203
0671 1.0183
0672 1.0184
0673 3.0031 7.0051
0674 1.0030 1.0284 8.0155
0675 1.0096 3.0031
0676 1.0183
0677 6.0019
0679 1.0183
0680 1.0183 3.0030
0681 1.0096 8.0112
0682 1.0183
0683 1.0203 3.0030
0684 1.0096 8.0112
0685 4.0014 7.0052 7.0074 8.0236
0686 1.0182 3.0031
0687 1.0182
0688 1.0183
0689 1.0096
0690 1.0096 8.0112
0691 1.0203 3.0031
0692 1.0096 8.0112
0693 1.0203
0694 1.0096 8.0112
0695 1.0183
0696 1.0183
0697 1.0182
0698 3.0067 6.0019
0699 1.0203
0700 1.0013 5.0024
0701 1.0203
0702 1.0182
0703 1.0182
0704 1.0203 3.0031
0705 1.0008 1.0031 3.0087 3.0088 5.0009 8.0040
0706 1.0001 3.0001 3.0002
0707 1.0001 3.0001 3.0002
0708 1.0001 3.0001 3.0002
0709 1.0183 2.0068 3.0030
0710 1.0203
0711 1.0096 8.0112
0712 1.0182
0713 1.0096
0714 1.0013 6.0013 8.0225
0715 1.0183
0716 1.0183
0717 1.0182
0718 1.0096 3.0031
0720 1.0013
0722 2.0075 3.0087 8.0112
0723 1.0183
0724 1.0203
0725 1.0203 3.0030 5.0046
0726 1.0183
0727 1.0183 3.0030
```

```
0728 1.0183 3.0030
0729 1.0182 3.0030
0730 1.0203
0731 1.0096 8.0112
0732 1.0183
0733 1.0183 3.0030
0735 1.0013
0736 1.0096
0737 2.0105 3.0030 8.0261
0738 1.0002 1.0008 3.0087 8.0001
0739 1.0002 1.0008 3.0087 8.0001
0740 1.0002 1.0008 3.0087 8.0001
0741 1.0183
0742 1.0013 1.0030 3.0087 4.0013 7.0074 7.0076
0743 1.0203 8.0142
0744 1.0203 2.0089 8.0142 8.0197
0745 1.0073 8.0141
0746 1.0026 5.0030 8.0142
0747 1.0258 8.0134
0748 1.0249 2.0166 8.0263
0749 1.0015
0750 1.0203 8.0142
0751 1.0015 5.0051 8.0142
0752 1.0272 5.0068 8.0239
0753 1.0015 2.0163
0754 1.0183
0755 1.0076 2.0101 3.0031 8.0190
0756 1.0271 2.0076 5.0043
0757 1.0203 8.0142
0758 1.0166 5.0045
0759 1.0015 2.0163
0760 1.0065 1.0090 2.0085 2.0106 8.0021
0761 1.0015 5.0051
0762 1.0001 3.0001 3.0002
0763 1.0001 3.0001 3.0002
0764 3.0019 8.0045
0765 1.0015 5.0051
0766 1.0203 8.0142
0767 2.0044 3.0069 5.0051 7.0085 8.0142
0768 8.0142
0769 1.0001 3.0001 3.0002 5.0067 5.0074 8.0056 8.0147
0770 1.0001 3.0001 3.0002 5.0067 5.0074 8.0056 8.0147
0771 1.0203 1.0235
0772 1.0235
0773 1.0235 3.0029 8.0142
0775 1.0231
0776 1.0015 5.0051
0777 1.0015
0778 1.0203 2.0164 8.0142
0779 1.0203 8.0142
0780 1.0078 3.0007 5.0028 6.0007 8.0002
0781 1.0015 5.0051
0782 1.0065
0783 1.0015
0785 1.0015 5.0051
0786 1.0015 5.0051
0788 1.0015 1.0120 5.0052 8.0142
0789 1.0073 8.0010
0790 1.0077 3.0013 5.0004 8.0056
0791 1.0077 3.0013 5.0004 8.0001
0792 1.0015 2.0085 5.0051
0793 1.0261 8.0144
0794 1.0120 5.0036 8.0142
```

```
0795 1.0203 1.0235
0796 1.0015
0797 1.0203 1.0235
0798 1.0250 8.0218
0799 3.0019 5.0011
0801 1.0203 2.0164 8.0142 8.0229
0802 1.0266 6.0021 8.0015 8.0230
0803 8.0017
0804 1.0015
0805 5.0034 8.0117
0806 1.0284 2.0080 8.0203
0807 1.0015 5.0051
0808 1.0073 8.0010
0809 1.0258 1.0271 2.0076 8.0142
0810 1.0273 4.0014 7.0074 7.0077 8.0164 8.0225
0811 1.0203 2.0084 2.0123 3.0069 8.0130 8.0142 8.0146
0812 1.0065 2.0085 2.0106 8.0021
0813 1.0203 8.0142
0814 1.0182 5.0046
0815 1.0182 5.0050
0816 1.0015 2.0163
0817 1.0203 8.0142
0818 1.0015
0819 1.0098 8.0020 8.0029
0820 1.0203 8.0142
0821 1.0203 2.0164 8.0142
0822 1.0073 8.0010
0823 2.0108 3.0007
0824 1.0203 1.0221 3.0088 5.0066 8.0032 8.0040
0825 1.0094 2.0116 5.0063
0826 1.0171 2.0116 2.0130 8.0016
0828 1.0247 8.0191
0829 7.0106
0832 3.0029 8.0142
0833 1.0073 8.0010 8.0027
0834 1.0015 5.0050 8.0142
0839 1.0247 8.0191
0840 1.0015 3.0069 5.0051
0841 1.0015
0843 1.0084 1.0102 2.0107 2.0138 5.0028 8.0002 8.0051 8.0055
0844 5.0034 8.0117
0846 1.0039 5.0069 7.0008 8.0012
0847 1.0015
0848 1.0274 3.0019
0849 1.0015
0851 1.0266 6.0021 8.0016 8.0230
0852 1.0042 2.0002 2.0098 2.0099 8.0040 8.0159
0853 1.0007 2.0002 2.0088 2.0129 8.0113
0854 1.0208 2.0045 5.0050
0855 1.0158 2.0117 8.0121 8.0168
0856 1.0203 8.0121
0857 1.0230 2.0082 8.0206 8.0209
0858 1.0192 3.0015 5.0040 8.0123
0859 1.0015
0861 1.0159 2.0096 8.0207
0862 1.0184
0863 1.0203
0864 1.0094 1.0249 2.0116 5.0037 5.0063
0865 1.0232 1.0249 8.0016
0866 1.0203 8.0142
0867 1.0073 8.0010
0868 1.0073 8.0010
0869 1.0203 8.0126 8.0142
```

```
0870 1.0203 8.0142
0871 1.0015 2.0163 5.0051
0872 8.0205
0873 1.0208 2.0045 5.0050
0874 1.0203 1.0258 8.0142
0875 1.0208 2.0045 2.0116 5.0050
0876 1.0032 1.0208 2.0116 6.0020 8.0013
0877 1.0160 3.0091 5.0039 7.0011 7.0012 8.0237
0879 1.0203 1.0235 5.0051 8.0142
0880 1.0274 8.0204
0881 1.0073 2.0060 3.0019 8.0141
0882 1.0231 8.0189
0883 1.0015 5.0051
0885 1.0226 2.0072
0886 1.0226 2.0072
0887 2.0106 5.0024
0893 1.0272
0894 1.0272
0900 1.0007 1.0010 2.0122 5.0028 8.0002
0901 1.0273 8.0130 8.0146
0902 1.0273 2.0084 8.0130 8.0146
0903 1.0015 5.0052 8.0152
0904 5.0030
0905 1.0203 8.0142
0906 1.0015 5.0051
0907 1.0163 1.0271 2.0076 5.0038
0908 1.0015 8.0142
0909 1.0203 8.0142
0910 1.0015 8.0142
0911 1.0159 2.0096 8.0207
0912 1.0065 2.0085 8.0021
0916 2.0120 7.0050
0917 1.0087 2.0047 2.0120 7.0050
0928 1.0006 1.0035 3.0005 7.0016
0929 1.0006 1.0035 3.0005 7.0016
0933 2.0158 8.0170
0934 1.0246 2.0020 3.0034 3.0048 7.0042 8.0109 8.0171 8.0219
0935 1.0246 2.0020 8.0109
0936 1.0246 2.0020 8.0109
0939 8.0167
0940 8.0165
0942 1.0234 3.0043 8.0253
0943 1.0234 3.0043
0949 1.0246 2.0020 3.0049 3.0080 7.0080 8.0171 8.0219
0951 1.0246 2.0020
0952 1.0246 2.0020
0954 1.0005 3.0013
0956 3.0012 8.0056
0957 1.0007 3.0014 3.0086 8.0113
0958 1.0306 2.0114 3.0090 8.0222
0959 1.0165 2.0176 3.0086 8.0247
0960 1.0306 2.0114 3.0090 8.0222
0961 8.0021
0962 1.0007 1.0044 1.0089 1.0123 7.0004 8.0004 8.0053
0963 1.0187 2.0036 3.0090 8.0222
0965 7.0021 8.0060
0966 7.0021 8.0060
0967 1.0001 3.0001 3.0002 8.0034
0968 1.0036 3.0015 8.0025
0969 1.0136 2.0160 3.0005
0970 1.0136 2.0160 3.0005
0971 1.0136 2.0160 3.0005
0972 1.0001 3.0001 3.0002 8.0034
```

```
0974 1.0136 7.0029
0975 1.0136 7.0029
0976 1.0002 1.0008 3.0086 3.0088 8.0032
0978 8.0157
0979 1.0136 7.0029
0980 1.0009 1.0107
0981 1.0009 5.0028 8.0055 8.0092
0982 1.0007 1.0085 2.0002 2.0129 3.0014 8.0113
0984 1.0007 3.0014 8.0113
0985 1.0005 3.0013 8.0056
0986 1.0001 3.0001 3.0002
0987 1.0004 1.0009 1.0107 3.0009
0988 2.0104 3.0007
0989 1.0034 1.0083 3.0007 8.0004
0992 1.0001 3.0001 3.0002 8.0056
0993 1.0083 3.0007 8.0004
0994 1.0029 3.0009 8.0051
0995 1.0004 1.0009 3.0008 8.0004 8.0055
0996 1.0042 3.0086 8.0040
0997 1.0001 3.0001 3.0002
0998 1.0002 1.0008 3.0086 8.0032
0999 1.0005 3.0005 5.0033 7.0016 8.0001 8.0056
1000 1.0005 3.0005 3.0006 5.0033 8.0056
1001 1.0001 3.0001 3.0002 8.0056
1003 1.0034 8.0055 8.0092
1004 1.0005 3.0012 8.0056
1005 1.0091 1.0205 3.0017 8.0086
1006 1.0009 5.0028 8.0055 8.0092
1008 1.0085 2.0141 3.0014 8.0113
1009 1.0004 1.0009 1.0029 3.0009 8.0004 8.0053
1010 1.0009 5.0028 8.0055 8.0092
1011 1.0009 5.0028 8.0055 8.0092
1012 1.0036 1.0053 1.0123 3.0003 3.0013 3.0015 8.0007
1013 8.0149
1015 1.0009 1.0107
1016 1.0052 2.0014
1017 1.0306 2.0114 3.0090 8.0222
1019 1.0007 3.0086 3.0088 8.0113
1020 1.0084 3.0007 4.0001 6.0001 8.0004
1021 1.0007 1.0083 3.0007 8.0004
1022 1.0307 2.0114 3.0090 8.0083
1023 1.0029 1.0036 1.0041 2.0107 8.0051
1024 1.0212 7.0094 8.0154 8.0237
1025 3.0012 8.0001 8.0032 8.0040
1027 1.0085 1.0221 2.0002 3.0086 5.0005 8.0040
1028 1.0002 1.0008 3.0086 8.0032
1029 1.0005 3.0013 8.0056
1030 1.0136
1031 1.0052 2.0114 3.0090
1032 1.0001 3.0001 3.0002 8.0034
1033 1.0001 3.0006 7.0016 8.0001
1034 1.0009
1035 1.0042 2.0002 8.0040
1036 1.0005 3.0006 8.0056
1037 1.0187 2.0114 3.0090 8.0222
1038 1.0018 2.0036 2.0173 3.0090 5.0095
1039 1.0005 8.0113
1040 1.0007 1.0089 2.0107 8.0004
1041 1.0091 1.0205 8.0086
1042 1.0005 3.0013 6.0001 8.0056
1043 8.0149
1044 1.0001 3.0005 3.0006 7.0016 8.0113
1045 1.0002 1.0008 3.0086 8.0032 8.0040
```

```
1046 1.0127 1.0136 7.0029
1047 2.0146 8.0021
1048 1.0005 3.0006 7.0016 8.0056
1049 1.0002 1.0008 3.0086 8.0032
1050 8.0050
1051 1.0279 8.0041
1052 1.0083 3.0007 6.0001 8.0051
1053 1.0002 1.0008 3.0086 8.0032
1054 1.0002 1.0008 3.0086 8.0032
1055 1.0091 1.0205 3.0017
1056 1.0029 1.0037 1.0041 1.0102 3.0010 8.0051
1058 1.0007 1.0083 1.0089 2.0041 3.0010 8.0004 8.0051
1060 1.0009 1.0102 2.0138 5.0028 8.0055 8.0092
1062 1.0091 1.0205 7.0041 8.0086
1064 1.0089 3.0010 8.0004
1065 1.0001 3.0001 3.0002 8.0056
1066 1.0009 1.0034 1.0036
1067 1.0187 2.0114 8.0222
1068 1.0007 2.0129 2.0159 8.0113
1069 1.0001 3.0001 3.0002 8.0034
1071 1.0002 1.0008 8.0032
1074 1.0009
1075 1.0009 1.0034
1076 3.0005 7.0029
1077 1.0042 2.0002 8.0040
1078 1.0001 1.0005 3.0003 3.0004 3.0013 8.0056
1079 1.0136 2.0160
1082 1.0221 2.0002 3.0086 5.0005 8.0040
1083 1.0002 1.0008 1.0011 5.0005
1084 1.0033
1085 1.0029 8.0051
1086 1.0041 1.0089 2.0107 5.0028 8.0002 8.0004
1087 1.0221 3.0086 8.0113
1088 1.0017 1.0284 4.0001 8.0203
1089 1.0029 1.0034 1.0037 1.0041 5.0028 8.0002 8.0051
1090 1.0102 2.0104 2.0107 3.0022 5.0017 7.0041 8.0009 8.0034
1091 1.0036 3.0015
1092 1.0009 1.0034 1.0036
1093 1.0005 3.0013 8.0001 8.0032 8.0040
1094 1.0036 3.0015
1095 1.0036 3.0015
1096 1.0001 3.0001 3.0002 8.0034
1097 1.0009 1.0107
1098 3.0011 8.0001 8.0032 8.0040
1099 3.0086 8.0040
1100 1.0005 3.0013 7.0016 8.0056
1101 1.0007 3.0014 8.0113
1102 1.0085 3.0014 5.0005 8.0113
1103 1.0001 3.0001 3.0002 8.0034
1104 1.0009 1.0034 8.0055
1105 1.0009 1.0034 8.0055
1106 1.0002 1.0008 1.0011 5.0005 8.0032
1107 1.0001 3.0001 3.0002 8.0034
1108 1.0007 3.0014 8.0113
1109 1.0007 3.0014 8.0113
1110 1.0018 2.0036 3.0090 5.0095
1111 1.0111 8.0050
1113 3.0012 8.0056
1114 1.0009 1.0034 1.0036
1115 1.0111
1116 1.0247 8.0191
1117 1.0007 1.0089 8.0053
1118 1.0034 1.0036 8.0004
```

```
1120 1.0306 2.0114 3.0090 8.0222
1121 1.0005 3.0005 3.0006 7.0016 8.0056
1122 1.0039 2.0004 7.0008 7.0020 8.0005
1123 1.0005 3.0013 8.0056
1124 8.0157
1126 1.0127 1.0136 2.0139
1127 1.0042 3.0086 8.0040
1128 1.0002 1.0008 3.0086 8.0032
1129 1.0284 8.0155
1131 1.0029 8.0051
1132 1.0036 3.0015 7.0020
1133 1.0306 3.0090
1135 1.0001 1.0005 3.0005 3.0006 7.0016 8.0113
1136 1.0001 3.0001 3.0002 8.0034 8.0056
1137 1.0042 2.0002 8.0040
1138 1.0036 3.0015
1139 1.0001 1.0005 3.0001 3.0002
1140 1.0306 2.0114
1142 1.0042 2.0002 3.0086 5.0005 8.0040
1143 3.0086
1144 1.0036 1.0083 8.0004
1145 1.0001 3.0001 3.0002 8.0056
1146 1.0009 1.0107
1147 3.0012 7.0016 8.0001 8.0032 8.0040 8.0056
1148 1.0001 3.0001 3.0002 8.0034 8.0056
1150 1.0036 3.0015
1151 1.0084 3.0007 4.0001 8.0004
1152 1.0084 3.0007 4.0001 8.0004
1153 1.0052 2.0036 2.0173 2.0114 3.0091 7.0012
1154 1.0042 8.0040
1155 1.0001 3.0006 7.0016 8.0113
1156 1.0005 3.0006 7.0016 8.0056
1157 1.0001 3.0002
1158 1.0007 1.0036 1.0089 3.0010 8.0004
1162 2.0106
1163 4.0014
1164 4.0014 8.0225
1165 1.0109 1.0158 2.0119 8.0051
1166 1.0067 2.0062 2.0075 4.0012 8.0020
1167 1.0067 2.0062 8.0020
1168 1.0067 2.0062
1170 4.0014 8.0103
1171 4.0014 8.0103
1172 1.0163 2.0064 2.0078
1173 1.0033 1.0056 7.0003 7.0004
1174 1.0067 2.0062
1176 4.0015 5.0024 7.0062
1177 1.0013 1.0096 2.0075 8.0112 8.0114
1179 1.0158 2.0119
1180 2.0078 2.0153 4.0014 7.0074 8.0225
1181 1.0163 2.0078 4.0015
1182 1.0163 2.0078 4.0015 5.0024
1183 1.0012 1.0036 1.0123 8.0053
1184 7.0074
1185 1.0163 2.0078 3.0037 7.0087 8.0052
1186 1.0122 2.0064
1187 1.0101 2.0023 3.0037
1189 1.0141 1.0163 2.0008 2.0064
1193 1.0067 2.0062 4.0012
1194 1.0096 1.0124 8.0231
1196 1.0033 1.0056 7.0003 7.0004 8.0052
1197 1.0033 1.0056 7.0003 7.0004
1198 1.0047 1.0067 1.0096 4.0012
```

```
1200 1.0067 2.0062 4.0012 8.0084
1201 1.0067 2.0062
1202 1.0067 2.0062
1203 1.0067 2.0062
1205 1.0158 2.0106 8.0103
1206 1.0158 2.0119
1207 1.0033 1.0056 2.0115 7.0003 7.0004
1208 1.0039 2.0113 7.0008 7.0014 7.0020
1209 1.0160
1210 1.0013 1.0014 2.0106
1211 1.0067 2.0062
1212 1.0067 2.0062 4.0012
1213 1.0034 1.0036 8.0055
1214 1.0007 1.0012 1.0097 8.0053
1215 3.0038 3.0039
1216 2.0107 2.0165 5.0002 8.0051
1218 1.0007 1.0012 8.0053
1219 1.0054 6.0014 8.0068
1220 1.0067 2.0062 4.0012
1221 1.0013
1222 1.0135 2.0008
1224 1.0163 2.0078 4.0015
1225 1.0109 2.0061 8.0043
1227 1.0048
1229 1.0013 2.0105
1230 1.0109
1231 1.0135 2.0008
1232 1.0135 2.0008
1234 1.0067 2.0062 4.0012
1235 3.0041
1236 1.0013 4.0014
1237 1.0013 2.0078
1238 1.0096 1.0163 4.0012 8.0084 8.0112
1239 1.0001 1.0056 1.0158 7.0003 7.0004
1242 1.0163 2.0078
1243 1.0056 7.0003 7.0004
1244 1.0056 1.0158 7.0003 7.0004 8.0052
1247 1.0067 2.0062
1248 1.0163 4.0015
1249 1.0113 1.0141 2.0008
1250 1.0065 2.0106 8.0021
1251 1.0067 2.0062 4.0012 8.0153
1252 6.0013
1254 1.0204 8.0086
1256 1.0141 2.0008
1257 1.0001 2.0064 2.0077 2.0078 7.0074 8.0103
1258 1.0158 2.0119 7.0074
1259 1.0163 2.0078
1260 1.0163 2.0078
1261 1.0047
1264 8.0107
1265 1.0109 1.0158 2.0119 8.0043
1267 1.0093 8.0158
1268 1.0093
1269 1.0001 3.0005 3.0006 7.0016
1270 1.0001 3.0005 3.0006 7.0016
1271 1.0001 3.0006 7.0016
1272 1.0153 2.0008 8.0052 8.0082 8.0112
1273 1.0066 2.0106 3.0035 8.0021
1274 1.0013 1.0164 8.0225
1275 1.0067 2.0062
1276 1.0281 2.0011 2.0113 8.0052
1277 1.0001 1.0004 1.0107 3.0009 5.0010 8.0055
```

```
1279 1.0109 2.0153
1280 1.0013 1.0014 8.0020
1281 1.0109 8.0043 8.0226
1283 1.0067 2.0062 8.0111
1286 4.0014 7.0074 7.0076 8.0103
1287 4.0013 4.0014 8.0103
1288 1.0158 1.0163 2.0012 2.0078 2.0106 4.0015 5.0024
1291 1.0067 1.0163 7.0062 8.0226
1292 2.0012
1293 1.0047 1.0113
1294 4.0014 8.0103
1295 1.0164 2.0064 2.0107 4.0013 4.0014 7.0074 7.0076 8.0236
1296 1.0141 1.0153 2.0008
1297 1.0056 7.0003 7.0004
1298 1.0163 2.0024 8.0043
1300 2.0113 4.0014 4.0015 7.0074 7.0075 8.0236
1301 2.0113 4.0013 4.0014 7.0052 7.0074 7.0075 8.0225
1302 1.0159
1303 1.0203 2.0063 8.0226
1304 1.0122 1.0163 2.0078 8.0051
1305 1.0198 8.0185
1306 1.0141 1.0153 1.0203 2.0008 8.0052
1307 1.0033 1.0056 1.0113 7.0003 7.0004
1308 8.0110
1309 1.0163 2.0078 8.0225
1310 1.0067 2.0062
1311 1.0163 2.0078
1312 1.0013 2.0075 2.0078 8.0226
1313 1.0013 1.0109 2.0113 2.0153 8.0226
1314 3.0088 7.0008 7.0014 7.0020
1316 1.0251 5.0055
1319 2.0007 5.0003
1320 1.0035 1.0039 5.0001 7.0008 7.0020 8.0019
1322 3.0012
1324 7.0008 7.0014 7.0020
1325 1.0035 1.0039 5.0001 7.0008 7.0020 8.0019
1326 1.0035 1.0039 5.0001 7.0008 7.0020 8.0019
1328 1.0203 8.0142
1329 1.0247 8.0191
1331 1.0039 3.0021 7.0008 7.0020
1332 1.0039 7.0008 7.0020
1333 1.0039 7.0008 7.0020
1336 7.0002 7.0003
1337 2.0003 7.0002 7.0003 8.0033
1338 1.0039 3.0021 7.0008
1339 1.0039 3.0021 7.0008
1340 7.0008 7.0020
1341 1.0039 7.0008 7.0020
1342 1.0015 1.0120 1.0203 5.0051 8.0142
1343 1.0106 3.0082 5.0053 8.0005 8.0046
1344 1.0039 7.0008 7.0020
1345 1.0039 7.0008 7.0020
1347 5.0048
1348 1.0039 3.0018 3.0021 7.0008 7.0020 8.0005
1350 5.0047
1351 3.0019 5.0003
1352 1.0106 3.0082 5.0053 8.0046
1353 1.0065 1.0090 2.0085 2.0106 8.0021
1354 1.0096 8.0153
1355 1.0203 1.0235 8.0142
1356 1.0099 8.0087
1357 1.0203 8.0142
1358 1.0001 1.0005 1.0035 3.0003 3.0004
```

```
1359 1.0001 1.0005 1.0035 3.0003 3.0004
1360 1.0039 3.0021 7.0008 7.0020
1361 1.0039 3.0021 7.0008 7.0020
1362 7.0008 7.0014 7.0020
1363 1.0039 7.0008 7.0020
1364 1.0039 7.0008 7.0020
1365 8.0149
1366 1.0039 7.0008 7.0020
1367 1.0007 2.0101 8.0113
1368 1.0259 8.0233
1369 7.0008
1371 7.0008 7.0014 7.0020
1372 1.0015 1.0120 5.0051 8.0142
1373 1.0039 7.0008 7.0020
1374 1.0039 7.0008 7.0020
1375 1.0099 8.0087
1376 1.0100 8.0039
1377 1.0100 8.0039
1378 1.0036 1.0081 1.0133 2.0021 5.0028 8.0055
1379 1.0039 7.0008 7.0020
1381 1.0035 5.0001 8.0019
1383 5.0073
1385 1.0106 3.0082 8.0124
1386 1.0099 8.0087
1390 8.0144
1391 1.0203 8.0142
1392 1.0203 8.0142
1396 2.0007 5.0003
1397 1.0203 8.0142
1398 1.0083 2.0041 8.0004
1399 1.0035 1.0039 5.0001 7.0008 7.0020 8.0019
1400 1.0035 1.0039 2.0004 2.0006 5.0001 7.0008 7.0020 8.0005 8.0019
1401 3.0019 5.0003 8.0212
1402 1.0039 5.0001 7.0008 7.0020 8.0005
1403 1.0221 5.0009 7.0032 8.0067
1404 1.0203 2.0089 8.0142
1405 5.0047
1406 5.0047
1409 1.0203 8.0142
1410 1.0007 1.0029 1.0036 1.0089 3.0010 5.0028 5.0054 8.0002 8.0051
1412 7.0008 7.0014 7.0020
1413 1.0039 3.0019 5.0003 7.0008 7.0020
1414 3.0019 5.0003
1415 1.0136 2.0102 7.0029
1418 1.0203 8.0142
1419 3.0019 5.0003
1420 2.0006 3.0019 5.0002 5.0003
1421 1.0035 5.0001 5.0002 8.0019
1423 1.0106 3.0082 5.0053 8.0046
1426 8.0088
1427 1.0202 8.0198
1428 1.0247 8.0191
1429 1.0090 1.0230 8.0148
1430 5.0053 8.0026
1431 1.0038 3.0021 5.0001 7.0009 7.0020 8.0026
1432 1.0247 8.0191
1433 1.0038 3.0021 7.0009 7.0020
1434 1.0203 8.0142
1435 1.0001 3.0001 3.0002
1436 1.0001 3.0006 5.0010 8.0001 8.0034
1437 1.0007 1.0036 1.0089 3.0010 5.0028 8.0002
1438 7.0020
1439 3.0019 5.0003
```

```
1440 1.0039 3.0019 7.0008 7.0020
1441 1.0038 1.0039 3.0088 7.0008 7.0014 7.0020
1442 1.0039 7.0008 7.0020
1443 1.0106 3.0082 5.0053 8.0046 8.0132 8.0160
1444 1.0203 1.0235 3.0057 8.0142
1445 3.0019 8.0045 8.0212
1446 3.0019 5.0003
1448 1.0039 7.0008 7.0020
1450 1.0090 4.0007 8.0021 8.0088
1451 1.0090 4.0007 8.0021 8.0088
1452 1.0033 7.0003 7.0004
1453 1.0033 7.0003 7.0004
1455 1.0067 4.0012
1456 1.0033 7.0003 7.0004
1458 1.0141 2.0008
1462 1.0067 4.0012
1465 1.0090 7.0003 7.0004
1466 1.0090 7.0003 7.0004
1467 1.0090 7.0003 7.0004
1468 1.0139 7.0045 8.0091
1469 1.0016 8.0063
1470 1.0135 2.0008
1476 1.0135 2.0008
1478 8.0078
1479 1.0134 6.0014 8.0236
1481 1.0153
1483 1.0259 4.0010 8.0231
1484 1.0067 4.0012
1487 1.0141 2.0008
1494 1.0163 4.0015
1496 1.0142 2.0009 2.0147 8.0069
1499 1.0033 7.0003 7.0004
1506 1.0013 2.0153 8.0226
1507 1.0163 4.0015 8.0226
1508 1.0008 1.0031 3.0086 5.0009 8.0040
1509 2.0049
1512 1.0090 4.0007
1513 1.0033 1.0153 7.0004
1517 1.0033 7.0003 7.0004
1518 1.0067 8.0231
1520 1.0141 2.0008
1521 1.0033 7.0003 7.0004
1524 1.0013
1525 1.0067 2.0062 4.0012
1526 1.0033 7.0003 7.0004
1527 1.0090 4.0007 8.0021
1528 1.0033 1.0090 4.0007 7.0004
1530 1.0138
1531 1.0141 2.0008
1534 1.0141 2.0008
1535 1.0093 8.0158
1536 1.0033 7.0003 7.0004
1537 8.0112
1539 1.0090
1540 1.0033 7.0003 7.0004
1541 1.0033 7.0003 7.0004
1544 1.0141 2.0008
1545 1.0033 7.0003 7.0004
1547 1.0033 1.0090 7.0003 7.0004 8.0021 8.0052 8.0088
1548 1.0135 2.0008
1549 1.0135 2.0008
1550 1.0033 7.0003 7.0004
1551 1.0067 4.0012
```

```
1553 4.0007
1554 4.0007
1555 8.0088
1556 1.0101 8.0036
1558 1.0109 2.0119 8.0043
1559 1.0109 2.0119 8.0043
1560 8.0103
1561 1.0033 7.0003 7.0004
1562 1.0067 2.0062
1563 1.0141 2.0008
1564 1.0141 2.0008
1565 1.0033 7.0003 7.0004
1566 1.0033 7.0003 7.0004
1567 1.0134 6.0014 8.0236
1568 1.0090 7.0003 7.0004 8.0021
1569 1.0090
1570 1.0090
1571 1.0153
1574 1.0101 7.0101
1576 1.0033 7.0003 7.0004
1577 1.0033 7.0003 7.0004
1578 1.0033 7.0003 7.0004
1588 1.0098 8.0029
1590 1.0067 2.0062 4.0012
1592 1.0005 7.0016
1593 1.0001 3.0001 3.0002
1594 1.0001 3.0001 3.0002
1595 1.0267 3.0003 3.0012 3.0016 8.0001 8.0056
1596 1.0105 8.0052
1597 1.0001 3.0001 3.0002 8.0001
1600 1.0187 2.0114 3.0090
1607 1.0042 1.0085 1.0301 3.0014 8.0040
1608 1.0038 1.0039 2.0133 3.0021 7.0008 8.0019
1609 1.0111 8.0050
1610 1.0005 1.0006 3.0013 5.0093 8.0101
1611 1.0192 2.0133 2.0136 3.0015
1613 1.0005 1.0006 3.0013 5.0093 8.0001 8.0101
1614 1.0033 8.0052
1615 1.0005 1.0006 2.0016 3.0012 3.0102 8.0001
1616 2.0006 3.0018 3.0019 3.0021 5.0002 8.0108
1617 1.0107 6.0001
1618 1.0105 8.0052
1619 1.0254
1620 1.0253 1.0302 5.0010 5.0032
1622 1.0042 2.0002
1623 1.0005 1.0006 3.0005 5.0092 8.0101
1624 1.0005 1.0006 3.0005 5.0093 7.0016 8.0101
1627 1.0300 3.0084 8.0251
1629 1.0034 3.0008 7.0023 7.0024 7.0025 7.0026 8.0004 8.0108
1632 1.0007 1.0012 8.0053
1637 1.0042 1.0301 3.0086 8.0040
1638 1.0005 1.0006 3.0005 5.0092 7.0016 8.0101
1640 1.0005 1.0006 3.0013 5.0093 8.0101
1641 1.0033 8.0052
1642 1.0005 1.0006 3.0013 5.0093 8.0101
1644 1.0107 8.0108
1645 1.0033 1.0107 2.0171 2.0172 7.0001 7.0002
1646 1.0005 1.0006 3.0013 8.0145
1647 1.0001 3.0001 3.0002 8.0034
1650 1.0001 3.0001 3.0002 8.0034
1651 1.0001 3.0001 3.0002 8.0145
1652 8.0149
1653 1.0001 3.0001 3.0002 8.0034
```

```
1655 3.0015
1656 1.0008 3.0086 5.0084 8.0249
1659 3.0061 8.0163
1661 1.0007 1.0083 3.0007
1662 1.0001 1.0002 3.0001 3.0002 3.0086 3.0088 4.0006 5.0028 8.0001
     8.0032         8.0040 8.0249
1664 1.0001 3.0001 3.0002
1665 7.0093 8.0242
1667 1.0107 6.0001 8.0055
1668 1.0005 1.0006 3.0005 5.0087 7.0016 8.0145
1669 8.0004
1671 2.0157 3.0061 8.0163
1672 2.0157 3.0061 8.0163
1674 1.0009 1.0034 8.0055
1675 1.0255 8.0246
1676 1.0255 8.0246
1677 1.0029 8.0055
1678 3.0009
1680 1.0008 1.0085 3.0087 5.0085 8.0113
1681 1.0008 1.0085 3.0087 5.0084 8.0249
1682 1.0173 2.0043 2.0157 3.0061 8.0163
1683 1.0034 1.0036 8.0242
1684 1.0004 1.0107 3.0009 5.0086 8.0055
1687 1.0034 1.0107 8.0055
1688 3.0012 8.0145
1689 1.0221 1.0222 3.0086 3.0087 8.0040
1691 1.0005 1.0006 3.0003 3.0004 5.0088 8.0056 8.0145
1692 1.0005 1.0006 3.0003 3.0004 5.0088 8.0056 8.0145
1694 1.0085 3.0014 8.0113
1695 1.0222 3.0014 8.0113
1696 1.0248 2.0102 3.0071 7.0083
1700 1.0001 3.0001 3.0002 8.0145
1701 1.0001 3.0001 3.0002 8.0145
1702 1.0005 1.0006 3.0013 8.0145
1703 1.0005 1.0006 3.0013 8.0145
1704 1.0005 1.0006 3.0005 5.0087 7.0016 8.0145
1705 1.0009 1.0034 8.0055
1709 3.0015 7.0084
1710 3.0009
1711 1.0001 3.0001 3.0002 8.0034
1712 1.0005 1.0006 3.0001 3.0002 8.0145
1713 8.0050
1714 1.0034 1.0107 8.0055
1717 1.0255 3.0097 8.0246
1719 1.0005 1.0006 3.0013 8.0145
1720 1.0005 1.0006 3.0013 8.0145
1723 1.0222 3.0086 3.0087 5.0085 8.0040
1729 1.0173 2.0043 2.0157 3.0061 8.0163
1730 8.0055
1731 7.0030
1733 8.0161
1735 1.0004 1.0107 3.0009
1736 3.0085
1744 3.0001 3.0002
1749 1.0034 1.0083 3.0007 8.0004
1751 1.0034 1.0107 8.0055
1755 1.0255 3.0097 8.0246
1757 1.0085 3.0014 8.0113
1758 1.0173 2.0043 2.0157 3.0061 3.0062 8.0163
1759 1.0036 3.0007 8.0004
1760 1.0034 1.0083 1.0089 3.0007 8.0004
1762 2.0157 3.0061 3.0062 8.0163
1763 2.0157 3.0061 3.0062 8.0163
```

```
1764 8.0055
1765 1.0107 6.0001 8.0055
1766 1.0005 1.0006 3.0004 5.0088 8.0056 8.0145
1767 1.0005 1.0006 3.0005 5.0087 7.0016 8.0145
1768 1.0107
1769 1.0034 1.0036 1.0107 8.0055
1770 1.0221 1.0222 3.0087 5.0084 8.0113
1771 3.0007 8.0004
1772 1.0107 6.0001 8.0055
1776 6.0001 8.0034
1779 8.0004
1780 1.0002 3.0087 5.0084 8.0249
1782 1.0005 1.0006 3.0013 8.0145
1783 1.0004 1.0107 3.0009 5.0086 8.0055
1785 1.0005 1.0006 3.0013 8.0145
1786 1.0005 1.0006 3.0013 8.0145
1789 1.0005 1.0006 3.0005 5.0087 7.0016 8.0145
1790 1.0029 8.0191
1792 8.0149
1796 1.0085 3.0014 3.0087 8.0113
1797 7.0041 8.0086
1800 1.0005 1.0006 3.0013 8.0145
1801 1.0006 3.0003 3.0013 8.0145
1802 1.0244 3.0095 7.0060 8.0076
1803 3.0095 7.0060 8.0208
1804 1.0263 2.0051 8.0183
1805 3.0095 5.0020 7.0037 7.0060 8.0219
1806 1.0262 8.0178
1807 1.0218 2.0058 3.0047 8.0093
1808 1.0218 2.0058 3.0047 8.0093
1809 3.0078 5.0075
1810 1.0233 2.0052 8.0179
1812 1.0162 1.0217 2.0057 5.0022 6.0016 8.0136
1813 1.0264 1.0292 2.0103 8.0262
1814 1.0275 2.0054 8.0220
1815 1.0051 3.0043 5.0018 8.0006
1816 1.0005 3.0013 5.0010 7.0016 8.0056
1817 1.0005 3.0013 5.0010 7.0016 8.0056
1819 3.0078 5.0075
1820 3.0078 5.0075
1821 1.0218 2.0058 3.0047 8.0093
1822 3.0044 3.0085 5.0027 8.0181
1823 1.0169 7.0103 8.0135
1824 1.0276 2.0059 4.0003 8.0137
1825 1.0086 4.0004 5.0072
1827 1.0162 1.0217 2.0057 5.0022 6.0016 8.0136
1828 1.0215 2.0054 8.0115
1829 1.0216 2.0055 2.0056 3.0046 3.0048 5.0021 8.0176
1830 1.0085 7.0024
1831 1.0085 3.0014
1832 1.0188
1833 3.0012
1834 3.0095 7.0060
1835 1.0033 7.0001
1836 1.0005 3.0013
1837 1.0038 3.0018 7.0010
1838 3.0050
1839 1.0005 3.0013
1840 1.0005 3.0005 7.0016
1841 1.0002 3.0086
1842 3.0095 7.0060
1843 1.0085 2.0101 7.0001 7.0002
1844 1.0023 3.0086 3.0088
```

```
1845 1.0002 1.0008 3.0087
1847 1.0005 3.0005 7.0016
1851 3.0015
1852 1.0036 3.0015
1853 1.0005 3.0013
1856 1.0239 2.0080 2.0095 4.0009 8.0216
1857 3.0095 7.0061
1858 1.0022 3.0001 3.0002
1859 1.0001 3.0001 3.0002
1860 1.0244 3.0095 7.0042
1861 1.0005 3.0001 3.0002
1862 1.0239 2.0095 8.0216
1865 1.0198
1866 1.0188 2.0081 8.0075
1867 3.0051
1868 1.0161 2.0050 7.0066 8.0172
1869 1.0168
1870 1.0129 8.0250
1871 1.0161 2.0050 8.0172
1872 1.0245 8.0238
1873 1.0245 2.0039 8.0238
1874 1.0001 3.0006 7.0016
1877 1.0245 2.0039 8.0238
1878 1.0074
1879 3.0085
1880 1.0165 2.0176
1881 1.0105
1882 1.0074
1883 3.0085
1884 3.0085
1885 3.0085 7.0003 7.0004 7.0065
1886 1.0006 3.0013
1887 1.0244
1888 1.0182 7.0060
1889 7.0060
1891 1.0245 2.0039 8.0238
1892 1.0188 2.0081 8.0075
1893 1.0188 2.0081 8.0075
1894 3.0085 8.0184
1896 1.0180 2.0094 2.0152
1897 1.0161 2.0050 8.0172
1898 1.0188 2.0081 8.0075
1899 1.0129 8.0250
1900 1.0198
1901 1.0161 2.0050 8.0172
1902 1.0129 8.0250
1903 1.0238 2.0083
1905 1.0129 8.0250
1906 1.0245 2.0039 8.0238
1907 3.0085
1908 1.0051
1910 1.0161 2.0050 8.0172
1911 1.0161 2.0050 8.0172
1912 1.0245 2.0039 8.0238
1915 1.0182
1916 1.0028 8.0184
1917 3.0047
1918 1.0072
1920 8.0184
1923 1.0200
1924 1.0161 2.0050 8.0172
1926 1.0129 8.0250
1927 7.0060
```

```
1928 3.0085 7.0065
1930 3.0085 6.0023
1931 1.0001 3.0005 7.0016
1932 1.0161 2.0050 8.0172
1933 1.0245 2.0039 8.0238
1934 1.0241 1.0245 1.0269 2.0039 8.0238
1935 3.0085 6.0023
1937 1.0072
1938 1.0188 2.0081 8.0075
1939 1.0161 2.0050 8.0172
1940 1.0182
1941 1.0033 3.0047 6.0023 7.0003 7.0004 7.0040
1942 1.0129 8.0250
1943 1.0074
1944 1.0245 7.0022
1945 1.0068 7.0022
1946 1.0068
1947 3.0095 7.0037
1948 1.0265
1949 1.0245 2.0039 8.0238
1950 1.0186
1951 3.0085
1953 1.0058 3.0044
1954 1.0058 3.0044
1955 1.0001 3.0006 7.0016
1956 1.0001 3.0006 7.0016
1957 3.0095 7.0060
1958 1.0201
1959 3.0040 3.0042 3.0078
1962 1.0201 3.0044
1965 1.0188
1966 1.0055
1967 3.0085
1968 3.0085
1970 1.0058 1.0201 3.0044
1971 1.0056 8.0252
1972 3.0047 8.0252
1974 1.0244 3.0095 7.0060 8.0076
1976 3.0095 7.0060
1977 3.0085 4.0002
1978 1.0244 8.0076
1980 1.0156 2.0029 6.0004 8.0071 8.0079
1981 1.0055 3.0036 5.0008 6.0011
1983 3.0095
1986 3.0095 7.0060
1987 3.0036 5.0008 6.0011
1988 1.0168
1989 1.0188 4.0017
1992 1.0051 3.0043 8.0253
1993 3.0044
1994 3.0095
1995 3.0095
1996 1.0144 3.0044
1999 3.0085
2000 1.0006 1.0035 3.0001 3.0002
2001 1.0006 1.0035 3.0001 3.0002
2002 1.0149 3.0050
2003 1.0058 3.0044
2004 1.0058 3.0044
2005 1.0244 8.0076
2008 1.0244 3.0095 7.0060 8.0076
2009 3.0047
2010 3.0095 7.0060
```

```
2011 3.0047
2012 3.0085
2013 3.0095 7.0060
2014 1.0144
2017 3.0085
2019 1.0058 3.0044
2020 1.0056 3.0044
2021 1.0244 3.0095 7.0060 8.0076
2022 6.0006 7.0031 7.0086
2023 3.0001
2024 1.0001 3.0001 3.0002
2025 1.0001 3.0001 3.0002
2029 1.0001 3.0006 7.0016
2030 3.0044 3.0085
2032 1.0161 2.0050 8.0172
2034 1.0244 3.0095 8.0076
2036 1.0061 3.0044
2037 3.0034 3.0095
2038 3.0047
2039 3.0047 7.0001 7.0002
2040 1.0182
2041 1.0201 3.0044
2042 1.0149 3.0050
2043 1.0244 3.0095 7.0060 8.0076
2045 2.0035 3.0085
2046 6.0006 7.0031 7.0086
2047 1.0001 3.0001 3.0002
2048 1.0244 3.0095 7.0060 8.0076
2049 1.0063
2050 1.0058 1.0105 3.0044 7.0002 7.0003 7.0059
2051 8.0120
2052 1.0156
2053 1.0001 3.0005 3.0006 7.0016
2054 1.0001 3.0005 3.0006 7.0016
2057 3.0047
2058 1.0244 3.0095 7.0060 8.0076
2059 1.0129 2.0144 8.0094
2060 1.0244 3.0095 7.0060
2061 3.0095 7.0060
2062 1.0035
2063 1.0035
2065 1.0008 3.0086
2066 3.0047
2067 1.0156
2068 1.0156 2.0029 6.0004 8.0071 8.0079
2069 3.0095 7.0060
2071 1.0112 3.0095 7.0060
2072 1.0061 3.0044
2073 1.0201
2074 1.0148 8.0071 8.0079
2075 3.0085
2076 3.0095
2077 1.0033 3.0047 7.0001 7.0002
2078 1.0148 8.0071 8.0079
2079 1.0244 3.0095 7.0060 8.0076
2080 1.0001 3.0001 3.0002
2081 1.0001 3.0001 3.0002
2082 1.0150 2.0140
2084 3.0095 7.0060
2085 3.0095 7.0042 7.0060
2086 3.0095 7.0060
2087 1.0151 6.0008 7.0081
2088 1.0244 3.0095 7.0060 8.0076
```

```
2089 1.0063
2090 1.0056 3.0044
2091 1.0201 3.0044
2092 3.0085
2094 1.0058 3.0044
2095 1.0051 2.0033
2096 1.0051 2.0033
2102 1.0149 3.0050
2103 3.0047
2104 3.0085 7.0065
2105 1.0128 2.0037 7.0058 8.0065
2106 1.0156 2.0029 6.0004 8.0071 8.0079
2107 1.0147
2108 1.0147
2109 1.0001 3.0005 7.0016
2110 3.0095 7.0060
2111 1.0128 2.0015
2112 1.0201 3.0044
2113 1.0063 8.0254
2114 1.0182 2.0020
2115 7.0048
2116 3.0095 7.0060
2117 3.0085 4.0002 7.0065
2118 3.0085
2119 1.0244 3.0095 7.0060 8.0076
2120 1.0244 8.0076
2121 3.0044
2122 1.0129
2124 1.0056 3.0047 7.0001 7.0002 7.0003 7.0004
2125 3.0047
2126 3.0047
2128 3.0032
2129 3.0095 7.0060
2130 1.0286 2.0156 8.0059
2131 1.0033 8.0052
2132 3.0032
2133 3.0032
2134 1.0061
2135 1.0061 3.0044
2136 1.0061 3.0044
2137 1.0063 7.0079 8.0254
2139 1.0146
2140 3.0047 7.0001 7.0002
2141 1.0007 1.0034 3.0007
2142 1.0007 1.0034 3.0007
2145 1.0006 3.0003 3.0005 3.0012 3.0016 7.0016
2146 1.0244 3.0095 8.0076
2147 8.0255
2148 1.0201 3.0044
2149 1.0149 3.0050
2150 3.0032
2151 1.0125
2153 2.0032 6.0006 7.0031
2154 1.0001 3.0006 7.0016
2155 3.0095 7.0060
2156 3.0095
2158 3.0085
2161 1.0149 3.0050
2162 1.0008 1.0011
2163 1.0008 3.0086
2168 1.0244 8.0076
2169 1.0244 8.0076
2170 1.0244 8.0076
```

```
2171 7.0031 8.0080
2172 1.0058 3.0044
2173 1.0143
2174 1.0051
2176 1.0144 8.0256
2177 8.0256
2178 3.0047 8.0066
2180 1.0151 6.0008
2181 1.0151
2182 1.0059 3.0085 7.0060
2183 2.0137 3.0033
2184 1.0021 2.0175 8.0270
2185 1.0021 2.0175 8.0270
2186 1.0146
2187 1.0061
2188 1.0151 6.0008
2189 1.0151 6.0008 7.0081
2190 1.0161 2.0050 8.0172
2191 1.0061 3.0044
2192 3.0040 5.0008 6.0011
2194 1.0001 3.0001 3.0002
2196 3.0095 7.0060
2197 3.0095 7.0060
2198 3.0085
2201 1.0002 3.0086
2202 3.0032
2203 1.0156 2.0029 7.0082 8.0071 8.0079
2204 1.0156 2.0029 7.0082 8.0071 8.0079
2205 1.0148 8.0071 8.0079
2206 1.0148 8.0071 8.0079
2208 1.0061 3.0044
2209 1.0001 3.0001 3.0002
2210 1.0001 3.0001 3.0002
2211 1.0001 3.0001 3.0002
2212 3.0047
2213 1.0034 3.0086
2214 1.0007 3.0086
2215 1.0149 3.0050
2217 1.0148 2.0014 6.0004 7.0082 8.0071 8.0079
2218 1.0148 6.0004 7.0082 8.0071 8.0079
2219 1.0201 3.0044
2221 2.0020 2.0034 2.0142 7.0080
2226 1.0244 3.0095 7.0060
2229 3.0085
2230 3.0085 4.0002
2232 7.0031 7.0086
2233 1.0137 8.0151
2234 1.0221 3.0086 3.0088
2235 1.0144 3.0044
2236 1.0140
2237 1.0173 7.0048
2240 1.0168 8.0255
2241 3.0085
2242 1.0007 1.0010 2.0107
2244 1.0056 3.0044 7.0002
2245 3.0006 7.0016
2246 1.0061 3.0044
2247 3.0050
2248 1.0149 3.0050
2249 1.0149 3.0050
2250 1.0001 3.0001 3.0002
2251 1.0001 3.0001 3.0002 5.0060 8.0001
2252 1.0001 3.0001 3.0002
```

```
2253 1.0005 1.0035 3.0005
2254 1.0001 3.0005 7.0016
2255 1.0244 7.0060 8.0076
2256 1.0148 6.0004 8.0071 8.0079
2258 3.0032
2259 3.0032
2260 1.0055 3.0036 5.0008 6.0011
2262 3.0085
2263 1.0105 7.0001 7.0002
2264 1.0058 3.0044
2265 1.0058 3.0044
2266 1.0056 3.0044 7.0002
2268 3.0085
2269 3.0085
2270 1.0057 6.0005
2271 3.0047 7.0001 7.0002 7.0040
2272 1.0001 3.0001 3.0002
2273 1.0001 3.0001 3.0002
2275 1.0161 2.0050 8.0172
2279 3.0036 5.0008 6.0011
2280 1.0128 2.0015
2281 3.0044 7.0002
2282 1.0128 2.0037 8.0065
2283 1.0056 3.0044
2284 1.0058 3.0044
2285 1.0144 8.0256
2286 1.0149 3.0050
2287 1.0201 3.0044
2288 1.0201 3.0044
2289 1.0007 1.0010
2291 1.0058 3.0044
2292 3.0095
2293 1.0056 3.0047 7.0003 7.0004 7.0097
2294 1.0036 2.0133 2.0136 3.0015
2295 3.0014
2296 1.0009 5.0028 8.0055 8.0092
2299 3.0015
2301 1.0267 2.0146 5.0089 6.0002 8.0035
2303 1.0284 8.0041
2304 5.0016
2305 1.0006 2.0016 3.0012 8.0145
2306 1.0006 2.0016 3.0012 8.0145
2307 1.0006 2.0016 3.0012 8.0145
2308 1.0006 2.0016 3.0012 8.0145
2309 1.0006 2.0016 3.0012 8.0145
2310 3.0086
2311 1.0042 3.0086 8.0040
2312 1.0001 1.0042 3.0003 3.0004 3.0086 8.0040 8.0056
2313 3.0019 8.0212
2314 1.0284 8.0203
2316 1.0105
2317 3.0095 7.0060
2319 1.0001 3.0001 3.0002 8.0001
2320 3.0085 4.0002
2321 1.0244 3.0095
2322 1.0267 8.0021
2323 1.0187 2.0079 3.0090
2324 1.0182
2327 3.0011
2331 1.0179 3.0026 3.0027 6.0017 8.0143
2332 1.0001 3.0001 3.0002
2335 1.0268
2336 1.0188 2.0081 8.0075
```

```
2337 3.0095 7.0060
2338 3.0095 7.0060
2339 1.0002 3.0086
2342 1.0001 3.0001 3.0002
2343 1.0001 3.0001 3.0002 8.0001
2344 1.0001 3.0001 3.0002
2345 1.0001 3.0001 3.0002
2346 1.0125 1.0177
2348 1.0105 7.0003 7.0004
2350 1.0245 2.0039 8.0238
2351 3.0019
2352 1.0007 1.0010
2354 1.0002 3.0086
2355 1.0129
2356 1.0038 3.0018 7.0008 7.0020 8.0005
2357 1.0175 6.0010
2358 3.0085 6.0023
2359 1.0004 1.0007 1.0010 1.0107 3.0009
2360 1.0105
2365 1.0056 7.0003 7.0004
2366 1.0056 7.0003 7.0004
2368 1.0187 2.0178 3.0090
2370 1.0001 3.0005 7.0016
2371 1.0038 1.0039 3.0018 7.0008 7.0020
2373 1.0035 3.0012
2375 1.0035 3.0005 7.0016
2376 1.0267 8.0021 8.0060
2377 1.0056 7.0003 7.0004
2378 1.0280
2379 1.0281 8.0052
2380 1.0001 3.0001 3.0002
2381 1.0001 3.0001 3.0002
2382 1.0001 3.0001 3.0002 8.0001
2384 1.0105 7.0001 7.0002
2385 1.0105
2386 7.0093
2390 1.0244 3.0095 7.0042 7.0060
2391 1.0152 8.0151
2392 1.0056 6.0002 7.0001 7.0002
2394 1.0035 3.0013
2395 1.0007 1.0010
2396 1.0001 1.0005 3.0003 3.0004 8.0056
2397 1.0005 3.0013 6.0001 6.0023
2398 1.0004 1.0107 3.0009
2399 1.0004 1.0107 3.0009
2400 1.0180 8.0081 8.0084
2401 1.0129
2402 1.0176
2406 1.0001 3.0006 7.0016
2407 1.0001 3.0001 3.0002
2408 7.0003
2409 3.0085
2410 1.0213 8.0169
2411 1.0214 8.0169
2429 2.0065 2.0087 7.0073 8.0210
2430 3.0015
2431 3.0014 3.0086
2432 2.0020 3.0095 7.0080 8.0219
2433 1.0246 7.0042 7.0080 8.0109
2435 8.0171
2436 8.0169
2442 3.0085 8.0181
2443 1.0161 2.0050
```

```
2444 3.0095 7.0060
2446 3.0095 7.0060
2447 3.0085
2448 2.0170 6.0030 8.0265
2449 1.0168 2.0050
2450 3.0095
2451 3.0085 7.0001 7.0002
2452 1.0112 2.0034 3.0095 7.0004 8.0071 8.0079
2453 6.0004 7.0080 8.0071 8.0079
2454 2.0142 7.0080
2455 3.0085 8.0184
2457 3.0095 7.0060 7.0107 8.0219
2458 3.0085 7.0001 7.0002 7.0065
2459 8.0157
2462 1.0295 2.0124 2.0167 5.0083
2463 1.0295 2.0124 2.0167 5.0083
2464 1.0295 2.0124 2.0167 5.0083
2468 1.0181 2.0070 8.0120
2469 3.0085
2470 3.0085 7.0065 8.0266
2471 1.0051 2.0077 3.0014
2472 1.0244
2474 1.0112 3.0095 7.0108
2475 1.0140 8.0140
2477 3.0095 7.0060
2478 1.0161 1.0294
2479 1.0296
2480 3.0085
2481 1.0297
2482 1.0063 8.0267
2483 3.0095 7.0060
2484 3.0036 3.0040 5.0008 5.0041 6.0011
2485 1.0051 2.0033 6.0011
2486 3.0085
2487 1.0035 3.0013
2488 1.0035 3.0013
2489 3.0095 7.0060
2492 3.0085
2493 3.0036 3.0040 8.0187
2495 3.0095 7.0060
2496 3.0085
2497 1.0028 8.0184
2498 1.0245 2.0039
2499 1.0161 2.0050
2500 3.0095 7.0060
2501 3.0085
2502 1.0168
2503 3.0056 5.0076
2504 1.0295 2.0168 5.0083 6.0025 6.0026
2505 1.0112 7.0060
2506 3.0085 6.0027
2508 3.0095 5.0020 7.0060 8.0208
2510 3.0005 3.0013 7.0016
2511 3.0085 4.0002 6.0028 7.0065
2512 1.0168
2513 1.0168
2515 3.0085
2516 1.0241 1.0269
2517 1.0244 3.0095
2518 1.0063
2519 3.0044 3.0085 7.0065
2521 1.0028 8.0184
2522 1.0298 2.0034
```

```
2523 3.0040 3.0078 5.0041
2524 5.0041
2525 3.0085
2526 3.0047
2527 1.0059 3.0095
2529 3.0095 7.0060
2530 1.0145
2531 3.0095 7.0060
2532 1.0105 8.0033
2533 1.0229 1.0281 2.0068 6.0010 7.0016 8.0052
2534 1.0279 8.0161
2535 1.0039 7.0008 7.0014
2536 1.0039 7.0008 7.0014
2537 1.0039 3.0018 7.0008 7.0014 7.0020
2539 1.0001 3.0001 3.0002
2540 1.0268 5.0090 7.0009 8.0008
2543 1.0039 5.0002 7.0014
2546 1.0039 2.0004 7.0008 7.0014
2548 1.0106 2.0016 3.0082
2550 1.0093 8.0158
2551 8.0241
2552 1.0282 8.0074
2554 1.0096 1.0284 8.0153
2555 1.0039 2.0004 7.0008 7.0014 7.0020 7.0044 7.0047 8.0004 8.0005
2556 1.0001 3.0001 3.0002 5.0010 8.0034 8.0056
2558 5.0090 8.0046 8.0232 8.0248
2559 7.0008 7.0014 7.0020
2561 8.0257
2562 1.0001 3.0001 3.0002
2563 1.0284 8.0155
2564 5.0002
2566 1.0280 8.0049
2567 3.0021 7.0009 8.0124
2568 1.0001 3.0005 5.0010 7.0016 8.0056
2569 1.0036 1.0089 2.0107
2570 1.0033 7.0003 7.0004
2571 1.0033 7.0003 7.0004
2572 1.0282 8.0074
2574 1.0036 3.0015 8.0025
2575 1.0036 3.0015 8.0025
2577 1.0038 1.0211 2.0121 7.0009 8.0005 8.0046
2579 1.0039 3.0018 7.0008 7.0014 7.0020
2580 2.0155 8.0037
2581 1.0280 2.0155 3.0096 8.0037
2586 1.0085 3.0014 3.0086 3.0087 3.0088
2587 1.0085 3.0014 3.0087
2592 7.0008 7.0014 7.0020
2593 1.0002 1.0008 3.0087 3.0088 8.0032
2594 1.0002 3.0086 3.0087 3.0088 5.0010 8.0032
2598 7.0008 7.0014 7.0020
2599 7.0008 7.0014 7.0020
2604 2.0006 3.0020
2606 1.0105 2.0003 8.0033
2607 1.0038 1.0039 7.0008 7.0014 7.0020
2608 1.0039 3.0018 7.0008 7.0014 7.0020
2609 1.0066 1.0153 2.0106
2610 1.0223 2.0106 8.0217
2612 2.0006 2.0007 3.0018 5.0003 7.0020
2613 2.0006 3.0018
2614 1.0038 3.0018 3.0021 5.0001 7.0009 7.0020 8.0005
2617 1.0004 1.0107 3.0009
2618 5.0002
2620 1.0105
```

```
2621 1.0182 7.0061
2622 2.0008
2623 1.0035 3.0005 7.0016
2625 1.0198 8.0185
2626 1.0198 2.0094
2627 1.0244 3.0095 7.0060
2628 1.0244 3.0095
2629 3.0047 7.0003 7.0004
2631 1.0004 1.0107 3.0009
2632 1.0129
2633 1.0182
2636 1.0135 1.0197 2.0008 8.0078
2637 1.0135 1.0197 2.0008 8.0078
2638 1.0033 7.0003 7.0004 8.0052
2639 1.0019 1.0082 6.0010 8.0099
2640 1.0225 8.0202
2641 1.0225 8.0202
2643 1.0090 8.0021 8.0088
2644 1.0090 8.0021 8.0088
2648 1.0237 8.0156 8.0173
2649 1.0240 3.0077 5.0057 7.0089
2653 2.0091 8.0119
2654 1.0090 8.0021 8.0088
2655 1.0033 7.0003 7.0004 8.0052
2656 1.0135 1.0197 2.0008 8.0078
2657 1.0101 8.0036
2659 1.0064 8.0077
2661 1.0090 8.0021 8.0088
2662 1.0141 2.0008 8.0078
2663 1.0033 7.0003 7.0004 8.0052
2666 8.0099
2669 2.0149 7.0092 8.0050
2677 1.0033 7.0003 7.0004 8.0052
2678 1.0067 4.0012 8.0112
2680 1.0019 8.0099
2683 1.0019 3.0018 5.0058 8.0099
2688 1.0207 2.0090 8.0150
2689 1.0090 8.0021 8.0088
2695 1.0236
2697 1.0033 7.0003 7.0004 8.0052
2698 1.0019
2699 1.0141 2.0008 8.0078
2700 1.0064 7.0006 7.0007 7.0027 7.0028 8.0077
2702 1.0001 1.0035 3.0003 3.0004
2703 1.0135 1.0197 2.0008 8.0078
2704 1.0135 1.0197 2.0008 8.0078
2709 1.0007
2711 1.0019
2714 1.0129 2.0144 8.0094
2717 1.0260 8.0139
2721 3.0030 8.0182
2726 1.0154 6.0010 8.0099
2727 1.0154 6.0010 8.0099
2728 8.0142
2729 1.0183 5.0079
2730 1.0035 3.0006 7.0016
2731 1.0035 3.0013
2732 1.0096
2733 1.0098 2.0077 8.0020 8.0021 8.0029
2734 1.0013 6.0013
2735 2.0153 4.0014 7.0074 8.0236
2736 8.0236
2737 1.0164 2.0105 6.0013 8.0225
```

```
2739 1.0001 3.0001 3.0002
2740 1.0001 3.0001 3.0002
2741 1.0098 8.0020 8.0021 8.0029
2743 1.0013 1.0014 6.0013
2744 1.0010 1.0014
2745 1.0027 8.0111 8.0149
2746 1.0097
2747 1.0097 3.0018 7.0008
2748 1.0096 5.0079
2749 6.0019
2750 1.0203 5.0079
2751 1.0203 5.0079
2752 6.0019
2753 3.0067
2754 4.0014 8.0103
2755 4.0013
2756 1.0096 2.0078
2757 2.0078 4.0015
2758 4.0014 8.0236
2759 1.0096
2760 5.0046 8.0114
2761 3.0068
2764 1.0010 1.0013 1.0014
2765 7.0074 8.0236
2767 1.0013 1.0163 2.0078
2768 1.0013 6.0013
2769 4.0013 8.0103
2770 2.0105 4.0013 8.0225
2771 1.0096
2772 1.0163 2.0078
2773 5.0079
2774 1.0073 1.0097 2.0060 8.0141 8.0142
2776 1.0171 1.0249 2.0116 2.0130
2777 1.0235 3.0069 8.0213
2778 4.0013 8.0236
2779 2.0078
2780 1.0009 2.0049 5.0028 8.0055 8.0092
2781 1.0013 5.0024
2782 1.0163 2.0078
2785 1.0096 8.0116
2786 1.0009 5.0028 6.0013 8.0055 8.0092
2787 1.0009 2.0049 5.0028 8.0055 8.0092
2788 1.0095 2.0154 8.0024 8.0122
2789 3.0085 5.0027 7.0040
2791 1.0013 5.0024
2792 2.0106 6.0013
2793 1.0014 4.0012 6.0013
2794 1.0119 1.0153 2.0008 8.0082
2795 1.0119 3.0069 8.0088
2796 1.0096 3.0031
2797 1.0013
2798 6.0019 8.0227
2799 1.0163 2.0078 8.0226
2800 1.0208 1.0268 2.0116 2.0131
2801 1.0209 1.0268 2.0166
2802 1.0183
2803 1.0183 3.0059
2804 1.0183
2805 1.0163 2.0078
2806 1.0013 4.0014 7.0074
2807 1.0182 3.0031
2810 1.0010 1.0089
2811 1.0010 1.0089 2.0049 2.0078 7.0008
```

```
2812 1.0013
2813 4.0015
2814 1.0013 1.0163 2.0078 4.0015 5.0024
2816 2.0106 8.0225
2817 1.0073 8.0010
2818 1.0163 2.0078 4.0015
2819 2.0106 5.0024
2820 1.0183
2821 1.0182
2822 1.0098 2.0077 8.0021 8.0029
2823 6.0019
2824 4.0014 8.0236
2825 1.0001 3.0001 3.0002
2826 1.0005 7.0008
2827 1.0163 2.0078 8.0226
2828 1.0183 5.0079
2829 1.0184 3.0030 3.0058 3.0070
2830 6.0019 7.0063
2833 1.0158
2834 1.0013 2.0078
2835 6.0019
2836 1.0098 2.0077 8.0021 8.0029
2837 1.0163 2.0078
2838 1.0013
2839 1.0098 2.0077 8.0021 8.0029
2840 1.0098 2.0077 8.0021
2842 4.0013 7.0074
2843 1.0164 4.0014 7.0074
2844 4.0013
2845 1.0163 2.0078 5.0024
2846 1.0013
2847 1.0096 1.0183 3.0031 5.0079
2848 1.0183
2849 1.0013 1.0163 4.0015 5.0024
2850 1.0163 2.0078 4.0015 5.0024
2851 1.0163 2.0078 4.0015
2852 1.0163 2.0078
2853 1.0013 1.0014
2854 1.0096
2855 1.0122 1.0163 2.0078
2856 1.0013 5.0024
2857 6.0019 8.0227
2858 1.0163 2.0078 4.0015 5.0024
2859 1.0203 8.0142
2860 1.0203 8.0142
2861 1.0203 8.0142
2863 1.0073 1.0097 8.0141
2864 1.0096 3.0031
2865 1.0098 3.0069 8.0021 8.0029 8.0227
2866 1.0013
2867 1.0109 2.0128
2868 1.0182
2869 1.0098 2.0077 8.0020 8.0021 8.0029
2870 1.0098 8.0021 8.0029
2872 1.0158
2873 1.0013
2874 1.0109 2.0119
2875 1.0007 3.0014
2876 1.0038 3.0018 7.0008
2877 1.0098 8.0021 8.0029
2878 1.0013 8.0226
2879 1.0183
2880 1.0183 3.0030
```

```
2881 1.0182 3.0030
2882 4.0013 7.0064 7.0074
2883 4.0013 7.0064 7.0074
2884 1.0163 7.0062 8.0226
2887 2.0078 2.0106 5.0024
2888 1.0098 8.0021 8.0029
2889 4.0013 4.0014 7.0074 7.0076
2890 1.0098 2.0077 8.0021 8.0029
2891 1.0098 2.0077 8.0021 8.0029
2892 4.0013 4.0014 7.0074
2893 1.0109 2.0010 8.0226
2894 1.0013 2.0145 8.0102
2895 5.0034 8.0117
2896 1.0073 8.0010
2898 1.0208
2899 1.0098 2.0077 8.0021 8.0029
2900 1.0109 2.0078 8.0043
2901 6.0019 8.0227
2902 5.0034 8.0117
2903 1.0098 1.0182 8.0021 8.0029
2904 1.0013
2905 6.0019
2908 3.0069 8.0088
2909 1.0007 1.0010
2910 1.0013 8.0225
2911 1.0098 8.0021 8.0029
2912 1.0013 2.0113 2.0153 4.0013 4.0014 7.0074 7.0076
2913 1.0109 2.0010 8.0226
2914 1.0013
2915 6.0019 8.0227
2916 1.0163 2.0078 2.0132
2917 6.0013
2919 6.0019 8.0227
2920 1.0183
2923 1.0158 2.0119 8.0103
2924 1.0183 3.0030 5.0046
2925 1.0183
2926 1.0081
2927 1.0208
2928 1.0163
2929 1.0163 2.0078
2931 1.0013
2932 1.0013 8.0225
2933 1.0266
2935 1.0015 1.0159
2937 1.0163 2.0078
2938 1.0096 4.0012 8.0084 8.0112
2939 4.0013
2940 1.0013
2941 5.0024 6.0019
2942 1.0109 2.0119
2943 1.0164 4.0013
2944 1.0109 2.0119
2945 1.0109 2.0119
2946 1.0183 3.0059
2947 1.0015
2948 1.0038 3.0018 7.0008 7.0020 8.0005
2949 1.0038 3.0018 7.0008 8.0005
2950 1.0013 5.0024
2951 1.0183 3.0030
2953 1.0183
2954 1.0203 8.0142
2955 1.0163 5.0024
```

```
2956 1.0015
2957 6.0019 8.0227
2958 1.0109 2.0010 7.0064 8.0226
2959 1.0010 1.0015
2960 1.0098 2.0077 8.0020 8.0021 8.0029
2963 1.0098 8.0021 8.0029
2964 1.0098 8.0021 8.0029
2965 1.0013
2966 1.0163 2.0078 4.0013 5.0024
2967 1.0163 8.0103
2968 1.0163 2.0078 8.0103
2970 1.0013 6.0013
2973 6.0019 7.0063
2974 6.0019 7.0063
2975 1.0183
2976 1.0183
2977 1.0183
2978 1.0013
2980 4.0013 4.0014 7.0074 7.0076 8.0103
2981 1.0163 2.0078
2983 1.0013 1.0258 8.0142
2984 1.0183
2986 1.0183
2987 1.0183
2988 1.0183
2989 1.0182
2990 1.0158
2991 8.0227
2992 1.0183
2993 1.0096
2994 1.0098 2.0077 8.0021 8.0029
2996 1.0135 8.0111
2997 1.0119
2998 4.0014 8.0225
2999 6.0019
3000 2.0077 2.0078 4.0015
3001 1.0203
3002 6.0019
3003 6.0019
3004 1.0098 2.0077 7.0062 8.0021 8.0029
3006 1.0183 3.0030
3007 5.0034 8.0117
3008 1.0159 2.0092
3009 1.0163 2.0078 5.0024
3010 1.0163 2.0078 4.0015 5.0024
3011 1.0003 3.0006 7.0016
3012 1.0183
3013 1.0182
3014 1.0095 4.0013 4.0014 7.0074 7.0076 8.0236
3015 1.0270 1.0271 2.0076 2.0078
3016 1.0109 2.0119
3017 1.0013 5.0024
3018 4.0013
3019 4.0013
3020 4.0013
3021 3.0082 8.0046
3022 1.0163 2.0078 3.0031 4.0015 5.0024
3023 8.0142
3024 1.0183 3.0030
3025 2.0078
3026 1.0203 8.0142
3027 6.0019
3028 1.0013
```

```
3029 1.0013
3030 1.0014
3031 1.0013 2.0013 2.0145 8.0102
3032 1.0183 3.0059
3033 1.0065 2.0135 3.0040 3.0078 5.0015 5.0041 8.0021 8.0088 8.0098
3035 1.0161 2.0017 8.0172
3036 1.0118 1.0154 8.0099
3039 3.0040 3.0078 5.0041
3040 3.0095 8.0076
3041 1.0118 6.0010 8.0099
3042 3.0085 5.0027
3043 2.0134 3.0085 5.0012 5.0027 8.0184
3044 5.0013 8.0186
3045 3.0003 5.0013 8.0186 8.0187
3046 1.0065 2.0135 3.0040 3.0078 5.0015 5.0041 8.0021 8.0088 8.0098
3047 3.0040 5.0008 8.0187
3048 3.0040 5.0008 8.0187
3049 1.0116 7.0046 8.0096
3050 1.0168 8.0185
3052 2.0148 3.0001 5.0010 8.0097
3053 3.0085 5.0027 7.0040
3054 1.0117 2.0027 2.0028 8.0095
3055 1.0065 1.0115 1.0154 8.0099
3056 6.0009
3057 1.0293 7.0002 8.0099
3058 1.0034 1.0036 2.0133 2.0136 3.0015 3.0085 5.0040 8.0123
3059 1.0034 1.0036 2.0133 2.0136 3.0015 5.0040 8.0123
3061 1.0121 5.0015
3062 1.0114 8.0100
3063 3.0044 3.0085 5.0027
3064 1.0129 1.0167 2.0038 2.0144 8.0094 8.0183
3069 1.0065 8.0021 8.0088 8.0099
3071 5.0027 8.0093 8.0184 8.0185
3072 3.0085 5.0027
3073 3.0085 5.0027 7.0001 7.0002 8.0181
3074 3.0085 5.0027
3075 1.0118 1.0154 6.0010 8.0099
3076 1.0118 1.0154 8.0099
3077 3.0085 5.0027
3078 3.0085 5.0027
3079 1.0129 2.0144 8.0094
3080 3.0044 3.0085 5.0027
3081 3.0085 5.0012 5.0027 8.0184
3082 1.0187 2.0079 3.0090
3083 1.0212 2.0115 2.0178 7.0002 8.0154
3084 1.0033 1.0287 2.0115 7.0001 7.0002 8.0052
3085 8.0149
3087 1.0173 2.0043 8.0163
3088 1.0173 2.0043 8.0163
3089 1.0173 2.0043 8.0163
3090 1.0187 2.0114 3.0090 8.0222
3091 1.0018 2.0036 2.0079 5.0095
3092 1.0160 3.0093 7.0012
3093 1.0008 3.0087
3094 1.0002 3.0086 8.0032
3095 1.0001 3.0001 3.0002 8.0034
3096 1.0105 2.0080 8.0235
3097 1.0160 1.0212 1.0289 3.0092 7.0012 8.0154
3098 1.0160 3.0092 7.0012
3099 1.0160 3.0092 7.0012
3101 3.0091 7.0012
3102 1.0306 2.0173 3.0089 5.0095
3103 1.0307 2.0036 3.0090 5.0095 8.0268
```

```
3104 1.0187
3105 1.0160 3.0092 7.0012
3106 1.0160 3.0093 7.0012
3107 1.0001 3.0006 8.0001 8.0034
3108 1.0160 1.0288 3.0093 7.0012
3109 1.0001 3.0001 3.0002 5.0010 8.0034 8.0113
3110 1.0071 1.0288 7.0013 7.0019 7.0109 8.0154 8.0237
3111 1.0089 3.0007 4.0001 5.0028 8.0053
3112 1.0187 2.0079 3.0089
3113 1.0085 1.0089 7.0023 7.0024 7.0025 7.0026 8.0051
3114 1.0160 3.0093 5.0023 7.0012 8.0245
3115 1.0212 3.0092 5.0023 7.0012 8.0245
3116 3.0091 7.0013
3117 1.0001 3.0001 3.0002
3118 1.0001 3.0001 3.0002
3119 1.0001 3.0001 3.0002
3120 1.0160 3.0091 7.0012
3126 1.0160 3.0091 7.0012
3127 1.0005 3.0005 7.0016
3128 1.0001 3.0006 7.0016
3129 1.0005 3.0005 7.0016
3130 7.0098 7.0099 7.0100 7.0104 7.0105
3131 1.0284 2.0080 8.0203
3133 1.0160 3.0092 7.0012
3134 1.0160 3.0093 7.0012
3135 1.0160 3.0091 7.0012
3139 3.0005 7.0016
3140 1.0029 3.0087
3145 1.0160 3.0093 7.0012
3146 1.0160 3.0093 7.0012
3147 1.0307 2.0114 3.0090
3148 1.0187 2.0114 3.0089
3149 1.0011 2.0125 8.0032 8.0040
3150 1.0071 3.0091 7.0012
3152 1.0160 3.0091 7.0012
3153 1.0160 3.0091 7.0012
3154 1.0160 3.0093 7.0012
3155 1.0160 3.0093 7.0012
3156 1.0212 1.0289 3.0092 7.0013 8.0154
3157 1.0212 3.0092
3158 1.0165 1.0212 3.0092 5.0023 8.0154 8.0247
3159 3.0092 7.0013 8.0154
3160 3.0091
3161 3.0091
3162 1.0160 3.0093 7.0012 7.0013 1.0071
3163 1.0160 3.0093 7.0012
3164 1.0307 2.0114 3.0090 5.0096 8.0222
3165 1.0307 2.0114 5.0095 8.0083
3166 1.0212 7.0013 8.0154
3167 1.0307 2.0114 5.0095 8.0083
3168 1.0307 2.0114 3.0090
3169 1.0307 3.0090
3170 1.0307 2.0114 3.0090
3171 1.0307 2.0114 3.0090
3172 1.0160 3.0093 7.0012
3173 1.0160 3.0093 7.0012
3174 1.0160 3.0093 5.0023 7.0012
3175 1.0160 3.0093 3.0103 5.0023 7.0012
3176 1.0001 3.0001 3.0002 8.0032
3177 1.0165 8.0163
3178 3.0062 8.0163
3179 8.0246
3180 1.0307 2.0114 3.0090 5.0096 8.0222
```

```
3181 1.0071 1.0160 3.0091 7.0012
3183 1.0307 2.0114 3.0090 8.0237
3185 1.0187 2.0079
3186 1.0187 2.0114 3.0090
3187 1.0160 3.0091 7.0012
3188 1.0160 3.0091 7.0012
3192 1.0160 3.0093 7.0012
3193 1.0160 3.0093 7.0012
3194 1.0160 3.0091 7.0012
3196 1.0071 3.0093 7.0013
3197 1.0288 3.0093 7.0012
3199 8.0246
3200 1.0173 8.0163
3201 1.0079
3202 8.0246
3204 1.0187 2.0079 3.0090
3205 1.0187 2.0079 3.0090
3206 1.0160 3.0091 7.0012
3207 1.0160 3.0091 7.0012
3209 8.0216
3211 1.0029 1.0043 3.0087 3.0088 8.0113
3212 1.0079 1.0160 1.0289 3.0092 5.0023 7.0012 8.0154
3213 1.0079 1.0160 3.0092 5.0023 7.0012 8.0154
3214 1.0004 1.0107 1.0221 3.0009
3215 1.0160 1.0212 1.0289 3.0092 7.0012 8.0154
3218 1.0001 3.0001 3.0002 8.0034
3219 1.0084 3.0007 4.0001 8.0004
3220 1.0160 3.0093 7.0012
3221 1.0007 1.0034 1.0083 3.0007 5.0028 8.0002
3223 1.0308 2.0174 8.0269
3224 1.0187 2.0079 3.0090
3225 1.0187 2.0079 3.0090
3226 1.0042 1.0085 3.0087 5.0010 8.0040
3227 1.0187 2.0114 3.0090
3228 1.0187 2.0114 3.0090
3229 1.0307 2.0114 3.0090
3230 1.0307 2.0114 3.0090
3231 3.0093 7.0012
3237 1.0107 3.0009
3238 1.0018 2.0036 3.0090 5.0095
3239 1.0160 3.0093 7.0012
3240 1.0187 2.0114 3.0090
3241 1.0187 2.0079 3.0090
3242 1.0187 2.0079 2.0173 3.0090
3243 1.0160 3.0092 7.0012
3244 1.0160 3.0093 7.0012
3246 1.0160 3.0091 7.0012
3248 1.0160 3.0092 7.0012 8.0154
3249 1.0212 7.0013 7.0094 8.0154
3250 1.0160 3.0091 7.0012
3251 1.0160 1.0212 3.0093 7.0012 7.0013
3252 1.0001 3.0001 3.0002
3253 1.0001 3.0001 3.0002
3254 1.0001 3.0001 3.0002
3255 3.0012
3256 1.0173 2.0043 8.0163
3257 1.0002 1.0008 3.0086 8.0032
3258 1.0002 1.0008 3.0086 8.0032
3259 1.0160 3.0093 7.0012
3260 3.0087
3261 1.0187 2.0114
3262 1.0187 2.0114 3.0089 3.0090
3263 1.0001 3.0001 7.0023
```

```
3264 1.0160 1.0288 3.0093 7.0012
3265 1.0160 1.0288 3.0091 3.0093 7.0012
3266 1.0071 1.0160 3.0091 3.0093 5.0080 7.0012 7.0013 8.0243
3267 1.0004 1.0009 3.0008
3268 1.0007 3.0087
3269 1.0187 2.0079 3.0090
3271 1.0007 8.0086 3.0088 8.0113
3272 1.0007 8.0086 3.0088 8.0113
3273 1.0187 2.0114 3.0090
3274 1.0160 3.0093 7.0012
3275 1.0160 3.0093 7.0012
3276 3.0012
3277 1.0187 2.0114 3.0090
3278 1.0160 7.0012
3280 1.0005 3.0005 7.0016 8.0056
3281 1.0001 3.0005 7.0016 8.0056
3284 1.0187 2.0114 3.0090
3285 8.0163
3288 1.0160 3.0093 3.0094 7.0012
3289 1.0034 1.0089 3.0007 8.0055
3291 1.0306 2.0173 3.0090 5.0095
3292 1.0165 2.0176 8.0247
3294 1.0160 3.0091 7.0012
3295 1.0160 3.0091 7.0012
3296 1.0187 2.0114 3.0090
3297 1.0165 2.0176 8.0247
3298 1.0127 1.0136 7.0017 7.0018
3299 1.0307 2.0114 3.0089
3300 3.0093
3301 1.0212 7.0013 7.0019 8.0237
3302 1.0160 1.0212 3.0092 7.0012 8.0154
3303 1.0071 1.0160 3.0093 3.0094 7.0012 7.0013
3304 1.0160 3.0091 7.0012
3305 1.0160 3.0091 7.0012
3306 1.0288 3.0093 7.0012
3307 1.0288 3.0093 7.0012
3308 1.0160 3.0091 7.0012
3309 1.0160 3.0093 7.0012
3310 1.0160 3.0092 7.0012
3311 3.0092
3312 1.0071 1.0160 3.0093 3.0094 7.0012
3313 7.0096
3314 1.0005 3.0005 7.0016 8.0113
3315 3.0005 3.0006 7.0016
3316 1.0160 3.0093 7.0012
3317 1.0160 3.0091 7.0012
3318 1.0187 2.0173 3.0090 5.0096 8.0222
3319 8.0149
3320 1.0007 3.0014 3.0086
3321 1.0036 2.0107 8.0004
3322 1.0007 1.0085 3.0014
3323 1.0307 2.0114
3324 1.0307 2.0114 3.0090
3325 1.0288 3.0093 7.0012
3326 3.0093 7.0012
3327 1.0021 2.0175 8.0270
3328 1.0021 2.0175 8.0270
3329 1.0160 3.0091 7.0012
3330 1.0002 1.0008 3.0086 8.0032
3331 1.0160 1.0288 3.0091 7.0012
3333 1.0002 1.0008 3.0086 8.0032
3334 1.0002 1.0008 3.0086 8.0032
3335 1.0160 3.0086 7.0012
```

```
3336 1.0160 3.0093 7.0012
3337 1.0160 3.0093 7.0012
3339 1.0187 2.0114 3.0090
3341 1.0160 3.0093 7.0012
3342 8.0163
3344 1.0004 1.0107 3.0009 8.0055
3345 1.0160 3.0091 7.0012
3346 1.0187 2.0079 3.0090
3347 3.0092 7.0012
3348 1.0160 3.0091 7.0012
3349 1.0160 3.0091 7.0012
3350 1.0002 1.0008 3.0086 8.0032
3351 1.0001 3.0001 3.0002 8.0034 8.0056
3352 1.0001 3.0001 3.0002 8.0034
3353 1.0001 3.0001 3.0002 8.0034
3354 3.0092
3355 3.0062 8.0163
3357 1.0160 3.0091 7.0012
3358 1.0018 2.0036 2.0079 5.0095
3359 1.0029 8.0051
3360 1.0029 1.0036 1.0089 3.0007 7.0023 7.0024 7.0025 7.0026 8.0004
     8.0051
3362 1.0160 3.0093 7.0012
3363 1.0018 3.0090 5.0095
3364 1.0018 2.0036 3.0090 5.0095
3365 1.0187 2.0114 3.0090
3366 1.0008 3.0087
3367 1.0160 3.0092 7.0012
3368 1.0165 8.0163
3369 1.0212 7.0013 7.0019 8.0154
3370 1.0160 3.0091 7.0012
3371 1.0160 3.0091 7.0012 7.0019 8.0154
3372 1.0160 3.0092 7.0012
3375 1.0173 2.0043 3.0062 8.0163
3376 1.0160 3.0091 7.0012
3377 8.0246
3378 3.0086 3.0087
3379 1.0085 3.0014 3.0086 3.0088
3380 1.0085 3.0014 3.0086 3.0088
3381 3.0092
3382 1.0160 3.0093 7.0012
3383 1.0160 3.0092 7.0012
3389 1.0160 3.0091 7.0012
3390 2.0178 3.0090
3391 1.0306 2.0079 3.0090 5.0096 8.0222
3392 1.0306 2.0079 3.0090 5.0096 8.0222
3394 1.0307 2.0114 3.0090
3395 1.0307 2.0114 3.0090 5.0096 8.0222
3398 1.0251 5.0055
3399 1.0007 1.0036 8.0004
3400 1.0212 8.0272
3401 1.0160 3.0091 5.0023 7.0012
3402 1.0001 3.0005 7.0016 8.0056
3403 1.0173 8.0163
3404 1.0012 1.0089 3.0007 5.0010 8.0004
3405 3.0090
3408 1.0036 3.0015 8.0025
3409 1.0034 1.0107 8.0055
3410 8.0163
3411 1.0187 2.0114 3.0090
3412 1.0012 1.0089 5.0010 8.0053
3413 1.0307 2.0114 3.0090 8.0083
3415 1.0034 1.0044 3.0007 8.0004 8.0051
```

```
3416 1.0036 1.0044 3.0007 8.0004
3417 1.0044 1.0085 3.0007 5.0010 8.0004
3418 1.0173 2.0043 8.0163
3419 1.0160 7.0012
3420 1.0187 2.0114 3.0090
3421 1.0160 3.0093 7.0012
3422 1.0160 3.0091 7.0012
3423 1.0052 3.0089 5.0096
3424 1.0052 3.0090 5.0096
3426 3.0091
3427 1.0160 3.0091 7.0012
3428 1.0307 2.0114 3.0090
3429 1.0036 3.0015 8.0025
3430 1.0160 3.0092 7.0012
3431 1.0007 1.0221 3.0014 5.0084 8.0040
3432 1.0071 1.0160 3.0093 7.0012
3433 1.0160 3.0092 3.0094 7.0012 7.0013
3434 1.0205 3.0017 8.0086
3435 1.0004 3.0009
3436 3.0009 8.0055
3437 1.0187 2.0079 3.0089
3438 1.0307 2.0114 3.0090
3439 1.0160 3.0091 7.0012
3440 3.0086 3.0087
3441 3.0087
3442 1.0052 2.0079 3.0090
3444 1.0173 2.0043 8.0163
3445 1.0173 2.0043 8.0163
3446 1.0173 2.0043 8.0163
3447 8.0163
3448 8.0163
3449 1.0160 3.0093 7.0012
3450 2.0093
3451 1.0187 2.0079 3.0090
3453 1.0307 2.0173 3.0090 5.0095 8.0083
3454 1.0109 2.0053 2.0119 8.0271
3457 1.0011 3.0001 3.0002 8.0034
3460 1.0193 8.0258
3461 1.0160 3.0092 7.0012
3462 1.0187 2.0079 3.0090
3465 1.0001 3.0001 3.0002
3466 8.0224
3467 1.0006 3.0005 7.0016
3469 8.0138
3470 1.0107 6.0001 8.0055
3471 1.0039 2.0004 7.0008 7.0020 8.0005 8.0019
3472 3.0018 7.0008 8.0005 8.0019
3473 1.0036 3.0015 8.0025
3474 1.0038 2.0004 7.0008 7.0020 8.0005 8.0019
3475 1.0004 1.0107 3.0009 5.0091 8.0055
3476 1.0039 2.0004 7.0008 7.0020 8.0019
3477 1.0039 3.0018 7.0008 7.0020 8.0019
3479 1.0004 3.0009 5.0091 8.0055
3481 2.0146 5.0089 8.0035
3482 1.0107 5.0091 6.0001 8.0055
3483 1.0007 8.0053
3484 1.0001 3.0001 3.0002
3485 1.0107 8.0055
3486 1.0006 3.0005 7.0016
3489 1.0038 7.0008
3490 1.0029 3.0010 8.0051
3493 1.0034 1.0083 2.0041 8.0004
3496 3.0015 7.0084
```

```
3497 1.0083 1.0256 1.0257 2.0041 7.0020
3498 1.0083 2.0041
3499 8.0125
3500 3.0086 8.0011
3502 1.0002 1.0011 2.0127 3.0086 3.0088 4.0006 5.0028 8.0001 8.0032
     8.0040
3504 1.0247 8.0191
3505 1.0247 8.0191
3508 8.0162
3509 1.0005 3.0013 5.0010 8.0056
3510 1.0033 6.0018 7.0072 8.0052
3512 1.0127 1.0136 5.0056 7.0017 7.0018 7.0091
3515 8.0221
3517 1.0136 1.0251 2.0046 2.0086 5.0055 7.0029
3518 1.0136 1.0251 2.0046 2.0086 2.0102 5.0055 7.0029
3519 1.0136 1.0251 2.0046 2.0086 2.0102 5.0055 7.0029
3520 8.0221
3521 1.0005 3.0005 5.0010 7.0016 8.0056
3523 1.0002 3.0086 3.0088 4.0006 5.0009 5.0028 8.0001
3524 1.0002 3.0086 3.0088 4.0006 5.0009 5.0028 8.0001 8.0051
3526 1.0037 1.0103 2.0107 8.0002 8.0051
3527 1.0033 6.0018 7.0072 8.0052
3528 8.0221
3529 8.0221
3530 8.0221
3531 1.0011 3.0001 3.0002 5.0010 8.0034 8.0040
3532 1.0004 1.0009 1.0010 1.0102 3.0009 3.0088
3533 8.0052
3534 1.0038 1.0039 3.0018 7.0008 7.0020
3535 1.0038 1.0039 7.0008 7.0020 8.0005
3539 8.0196
3540 1.0038 3.0018 5.0032 7.0009 7.0020 8.0005
3541 3.0019 5.0003
3542 2.0016 3.0012 5.0032 7.0016 8.0056
3543 1.0005 3.0012 5.0032 8.0056
3545 1.0103 3.0008 5.0028 8.0002 8.0051
3546 1.0001 3.0001 3.0002 5.0010 8.0034
3547 3.0012 5.0032 8.0056
3548 3.0019 5.0003
3550 1.0107 4.0001 8.0055
3551 1.0038 1.0039 7.0008 7.0020 8.0005
3552 2.0006 3.0018 3.0019 5.0002 5.0003 8.0045
3553 1.0136 1.0251 2.0046 2.0086 4.0005 5.0055
3555 1.0033 1.0281 6.0018 7.0072 8.0052
3556 1.0038 1.0039 7.0008 7.0020 8.0005
3557 1.0042 2.0002 3.0014 3.0086 3.0087 5.0033 8.0040
3558 8.0050
3559 1.0001 3.0005 5.0010 7.0016 8.0056
3560 1.0085 3.0086 3.0087 3.0088 5.0031 8.0004
3562 1.0081 1.0089 2.0107 5.0031 8.0002 8.0004
3563 1.0085 3.0086 3.0087 3.0088
3564 1.0107 6.0001 8.0055
3565 1.0267 2.0100 5.0089 6.0002 7.0020 8.0035
3567 1.0001 1.0070 3.0001 3.0002 5.0010 8.0034
3568 1.0001 3.0001 3.0002 5.0010 8.0034
3569 1.0001 3.0001 3.0002 5.0010 8.0056
3570 1.0005 3.0005 5.0032 7.0016 8.0056
3571 1.0136 1.0251 2.0046 2.0086 5.0055
3572 1.0285 8.0174
3573 1.0284 8.0242
3574 1.0283 8.0127
3575 1.0085 1.0089 3.0086 3.0087 3.0088 5.0031 8.0004
3576 1.0127 1.0136 1.0251 2.0102 3.0005 3.0071 3.0072 5.0056 7.0017
```

```
     7.0018 7.0029
3577 1.0005 3.0005 5.0010 7.0016 8.0056
3578 1.0005 3.0001 3.0002 5.0032 8.0056
3579 1.0001 3.0001 3.0002 5.0010 8.0034 8.0056
3580 1.0190 2.0069 3.0020 5.0033
3582 8.0221
3583 8.0221
3584 1.0005 3.0005 5.0010 5.0032 7.0016 8.0056
3585 1.0002 1.0085 3.0014 3.0086 3.0088 5.0009 8.0113
3586 1.0033 2.0064 6.0018 7.0072 8.0052
3590 1.0107 6.0001 8.0055
3591 1.0091 1.0204 1.0205 2.0107 7.0020 8.0086
3592 8.0050
3593 1.0001 3.0001 3.0002 5.0010 8.0034
3594 1.0005 3.0013 5.0010 8.0056
3595 1.0001 3.0001 3.0002 5.0010 8.0056
3596 1.0010 3.0010 5.0031 8.0004 8.0051
3597 1.0127 1.0136 1.0251 3.0072 5.0056 7.0017 7.0018 7.0029
3600 1.0107 6.0001 8.0055
3602 1.0285 8.0174
3605 1.0005 1.0035 3.0005 5.0010 7.0016 8.0001 8.0040 8.0056
3606 1.0203 8.0142
3607 1.0091 1.0205
3608 1.0136 1.0251 2.0046 2.0086 5.0055 7.0057 7.0090
3609 1.0085 3.0014 3.0086 3.0087 3.0088
3610 1.0001 3.0001 3.0002 5.0010 7.0035 8.0034
3611 1.0136 1.0251 5.0055 7.0017 7.0018
3612 1.0136 1.0251 5.0055 7.0017 7.0018 7.0029 7.0057
3614 1.0247 8.0191
3615 1.0247 8.0191
3618 1.0247 8.0191
3619 1.0247 8.0191
3620 1.0005 1.0035 3.0005 5.0032 7.0016 8.0056
3621 1.0107 6.0001 8.0055
3622 3.0012 5.0032 8.0056
3623 3.0019 5.0003
3625 1.0101 8.0036
3629 1.0001 3.0001 3.0002 5.0010 8.0034
3631 1.0001 3.0001 3.0002
3632 1.0085 1.0089 3.0086 3.0087 3.0088 5.0033 8.0113
3633 1.0247 8.0191
3634 1.0085 3.0014 3.0086 3.0087 3.0088
3636 1.0161 8.0172
3637 1.0153 8.0064
3638 1.0141 2.0008 8.0082
3639 1.0033 7.0003 7.0004 8.0052
3640 3.0082 8.0046
3643 8.0062
3644 1.0154 5.0071 6.0010 7.0003
3645 1.0180 8.0081
3646 1.0180 8.0081
3647 1.0161 8.0172
3649 1.0007 8.0004
3650 1.0006 1.0035 3.0005 7.0016 8.0056
3651 1.0001 3.0006 7.0016 8.0056
3652 1.0001 3.0001 3.0002 8.0040
3653 1.0002 1.0008 3.0086 3.0088 4.0006 5.0028 8.0001
3655 1.0067 2.0062 8.0112
3656 2.0008 2.0150 2.0151 7.0088
3657 1.0129 8.0131
3659 1.0188 2.0081 8.0075
3660 1.0161 8.0172
3662 1.0154 8.0099
```

```
3663 1.0243 8.0200
3664 1.0284 8.0203
3666 1.0219 8.0085
3667 1.0224 8.0118
3668 1.0006 3.0013
3671 1.0006 2.0016
3672 1.0265 8.0061
3673 1.0033 7.0003 7.0004 8.0052
3675 1.0034 3.0010 8.0051 8.0053
3676 8.0021 8.0088
3677 1.0161 8.0172
3678 1.0033 7.0003 7.0004 8.0052
3679 7.0003 7.0004 8.0021 8.0035 8.0055 8.0088
3680 5.0061
3681 1.0198 8.0185
3682 1.0188 2.0081 8.0075
3686 1.0001 3.0001 3.0002 7.0016 8.0034
3687 1.0033 2.0018 8.0099
3688 1.0220 5.0062
3689 1.0154 5.0071 6.0010 7.0003
3691 1.0067 2.0062 8.0112
3692 1.0067 2.0062 4.0012 8.0112
3695 1.0056 3.0085 7.0042
3696 1.0244 8.0076
3698 1.0129 8.0131
3699 1.0129 8.0131
3700 1.0056 3.0047 3.0085 5.0059 7.0001 7.0002 7.0003 7.0004 8.0093
3703 1.0265 8.0061
3707 1.0088 1.0180 8.0081
3709 1.0007 1.0034 8.0004
3710 1.0161 8.0172
3712 8.0238
3713 3.0095 7.0060
3714 1.0011 3.0012 8.0001
3715 1.0062 8.0062
3716 1.0163 2.0022 2.0078 2.0080 5.0035
3726 3.0006
3739 1.0051 5.0018
3740 1.0051 5.0018
3750 3.0012 5.0018 8.0032
3751 3.0019 5.0002 8.0212
3753 1.0203 1.0235 3.0069 8.0088
3755 1.0259 2.0110 7.0039 8.0231
3756 1.0109 2.0109 8.0226
3757 8.0142
3758 1.0203 8.0142
3759 1.0203 2.0084 3.0069 8.0142
3760 3.0019 8.0223
3763 1.0020 8.0141
3764 1.0163 4.0015 5.0024
3765 1.0163 2.0073 2.0078 5.0024
3766 1.0203 8.0142
3767 1.0247 8.0191
3770 1.0164 5.0024 8.0236
3771 8.0234
3774 8.0142
3775 4.0013 4.0014 7.0074 8.0225
3776 1.0203 8.0142
3777 1.0203 8.0142
3779 1.0065 1.0090 2.0077 2.0106 8.0021
3780 1.0203
3781 1.0163 4.0015
3782 1.0015
```

```
3783 1.0002 1.0008 3.0086 3.0087 3.0088 5.0065 8.0014
3786 1.0096 4.0012 8.0112 8.0116
3787 1.0096 4.0012 8.0112 8.0116
3789 1.0073 8.0010
3791 1.0075 3.0013 5.0004 7.0016 8.0201
3792 1.0247 8.0191
3793 1.0203
3794 1.0259 4.0010 8.0231
3797 1.0203 8.0142
3798 1.0013 1.0014 5.0026
3800 1.0015 5.0051 8.0129
3801 1.0163 4.0015 5.0025 7.0062 8.0226
3802 1.0163 4.0015 5.0035 8.0225
3803 4.0015 5.0025
3804 1.0163 4.0015
3806 1.0044 3.0007 3.0064 4.0008 5.0044 8.0004
3808 1.0109 2.0153 8.0226
3809 1.0013 2.0112 5.0025
3811 1.0163 2.0078 5.0025 5.0035
3814 1.0163 2.0071 8.0195
3816 1.0259 8.0233
3817 1.0163 4.0015 7.0062 8.0226
3818 1.0163 2.0073 2.0078 4.0015 5.0025 8.0226
3819 1.0163 4.0015
3820 1.0163 4.0015 5.0024
3821 2.0109 8.0226
3822 1.0163 5.0025
3823 1.0163 2.0071 7.0043 8.0195
3824 1.0015 5.0051
3825 2.0078 4.0015
3827 1.0003 3.0001 3.0002 3.0066 5.0064 8.0028
3830 1.0033 7.0003 7.0004 7.0054 8.0052
3831 1.0015
3832 1.0203 2.0060 8.0142
3833 1.0066 8.0029
3836 1.0065 1.0066 2.0106 2.0118 8.0021
3837 1.0122 2.0078 8.0226
3838 1.0203
3839 3.0069
3840 1.0203 2.0076 5.0051
3842 1.0163 1.0271 2.0076 8.0213
3843 1.0155 2.0162 8.0260
3844 1.0119 1.0170 1.0203 1.0235 3.0029 3.0069 8.0088 8.0142
3847 1.0163 8.0226
3849 1.0203 8.0142
3850 1.0178 5.0054 8.0228
3854 1.0107 5.0049 8.0199
3856 1.0163 2.0078 5.0035
3857 1.0163 4.0015 5.0035
3858 1.0163
3859 1.0067 4.0012 8.0112 8.0116
3861 1.0203
3862 1.0015 2.0060 5.0051 8.0142
3863 1.0203 8.0142
3864 5.0051 6.0019 8.0142
3865 1.0203 8.0142
3866 1.0109 2.0010 2.0080 8.0043 8.0226
3868 1.0001 1.0035 3.0003 3.0004 5.0065 8.0056 8.0234
3870 1.0163 2.0078 5.0025 7.0062 8.0226
3871 1.0203
3872 2.0097 2.0159 8.0234
3875 1.0252 1.0290 8.0053
3880 1.0163 2.0078 4.0015
```

```
3881 2.0078 4.0015 5.0035
3882 1.0163
3883 1.0163
3884 1.0163
3885 1.0013 1.0014 5.0082
3886 1.0013 1.0014 5.0025 6.0019 8.0021 8.0166
3887 1.0163 2.0078 4.0015 5.0035
3888 1.0203 3.0069 8.0142
3889 1.0080 3.0029 7.0056 8.0010 8.0142
3890 1.0259 8.0142
3891 1.0015 1.0203 8.0142
3892 1.0203
3893 1.0015 8.0142
3894 1.0060 2.0025 3.0043 5.0006 8.0006
3895 1.0033 7.0003 7.0004 8.0052
3896 1.0033 7.0003 7.0004 8.0052
3897 1.0090 8.0021 8.0088
3901 1.0153 8.0070
3902 1.0001 1.0005 3.0003 3.0004 5.0065 8.0234
3904 1.0141 2.0026 8.0078 8.0082
3906 1.0161 1.0180 2.0050 8.0081 8.0084
3907 1.0161 1.0180 2.0050 8.0081 8.0084
3909 1.0064 7.0028
3911 1.0157 8.0089
3913 1.0090 8.0021 8.0088
3916 1.0064 7.0005 7.0006 7.0007 7.0027 7.0028 8.0077
3917 1.0033 1.0056 7.0003 7.0004 8.0052
3926 1.0081 5.0054 8.0051
3927 1.0064 6.0012 7.0005 7.0006 7.0007 7.0027
3928 1.0141 2.0008 2.0074 8.0078 8.0082
3929 1.0064 2.0143 5.0007 6.0012 7.0006 7.0007 7.0027 7.0028 7.0049
     8.0077
3931 1.0090 8.0021 8.0088
3937 1.0033 7.0003 7.0004 8.0052
3938 1.0154 8.0099
3943 1.0219 8.0085
3944 1.0135 1.0141 2.0019 8.0078
3951 1.0130 8.0073
3954 1.0090 8.0021 8.0088
3955 1.0064 7.0049
3957 1.0067 2.0062 4.0012 8.0090
3961 1.0033 7.0003 7.0004 8.0021
3962 1.0033 7.0003 7.0004 8.0052
3963 1.0033 7.0003 7.0004 8.0052
3966 1.0065 1.0090 7.0003 7.0004 8.0021
3968 1.0090 8.0021
3969 1.0065 7.0003 7.0004
3972 3.0086 5.0070 8.0072
3973 1.0090 8.0021 8.0088
3975 1.0064 6.0012 7.0005 7.0006 7.0007 7.0027 8.0077 8.0085
3976 1.0054 8.0068
3977 1.0154 6.0010 8.0099
3978 1.0064 5.0007 6.0012 7.0005 7.0006 7.0007 7.0027 7.0028 7.0049
     8.0077
3979 1.0064 7.0005 7.0006 7.0007 7.0027 7.0028 8.0077
3980 1.0033 7.0003 7.0004 7.0027 8.0052
3988 1.0009 1.0107 2.0049 5.0028 8.0055 8.0092
3990 1.0083 2.0041 8.0004 8.0053
3991 1.0003 3.0006 5.0064 7.0016 8.0028
4012 1.0188 2.0081
4051 1.0244
4084 1.0049 6.0031 8.0188
4085 1.0049 6.0031 8.0188
```

```
4101 1.0310 8.0214
4110 3.0001 3.0002
4111 3.0001 3.0002
4112 3.0001 3.0002
4113 1.0244 8.0177
4120 7.0038
4121 3.0045 3.0048 3.0049 7.0036 7.0042 7.0069
4123 3.0023
4127 1.0303 3.0075 6.0032 7.0033
4128 1.0278 5.0078 6.0011
4129 1.0195 3.0076
4131 3.0085 4.0018
4132 1.0001 3.0001 3.0002
4133 1.0001 3.0001 3.0002
4134 1.0161 8.0172
4135 3.0095 7.0060
4136 1.0244 7.0060
4137 3.0095 7.0060
4139 1.0051 5.0018 8.0022
4140 3.0085
4141 3.0085
4142 3.0036 6.0011
4143 3.0036 5.0008
4144 5.0008
4145 3.0078
4146 3.0047
4147 3.0085
4148 1.0055 5.0008 6.0011
4150 1.0051 3.0043 8.0022
4151 3.0085 8.0184
4152 1.0055 5.0008
4153 1.0128 8.0177
4154 3.0053 3.0054 3.0055 6.0024 7.0034 7.0042 8.0192
4155 3.0075
4156 3.0075
4157 3.0085 8.0184
4158 3.0085 8.0184
4159 3.0085 7.0001 7.0002
4160 1.0172 2.0158 8.0170
4161 3.0085
4162 3.0085
4163 1.0007 1.0034 2.0107 5.0031 8.0004
4164 3.0085
4165 1.0244 3.0095
4168 1.0128 8.0177
4169 1.0128 8.0177
4170 1.0128 1.0244 2.0037 8.0171
4172 1.0278 3.0025 5.0008
4173 1.0055 5.0008
4174 1.0051 5.0018 8.0006
4175 1.0129 2.0144 3.0075 8.0094
4176 1.0196
4177 2.0126 2.0142 7.0038
4178 1.0114 3.0095 7.0060
4180 6.0011
4181 1.0051 3.0023 5.0018 8.0022
4182 1.0051 5.0018 8.0022
4183 3.0085 8.0093
4184 3.0085 8.0093
4186 1.0128
4187 1.0069 2.0048 3.0052 5.0077 8.0264
4189 3.0085 6.0027
4190 3.0036 6.0011
```

```
4191 3.0036 6.0011
4192 5.0008
4193 1.0055 3.0028 5.0008
4194 3.0025
4195 1.0051 1.0234 5.0018
4196 1.0055 3.0036 6.0011
4197 1.0128 2.0020 2.0126 2.0142 5.0094 7.0080
4202 3.0085
4203 3.0075 8.0186
4204 3.0075
4205 1.0005 3.0001 3.0005 7.0016 7.0068
4206 1.0001 3.0001 3.0005 7.0016
4207 1.0001 3.0001 3.0005 7.0016
4208 1.0055 3.0065 5.0008 6.0033
4209 1.0129 2.0038 8.0094 8.0183
4210 1.0129 2.0038 8.0094 8.0183
4211 1.0128 8.0177
4212 1.0128 8.0177
4213 3.0095
4214 1.0210 2.0040
4215 1.0244 3.0095 7.0060
4216 1.0299
4217 1.0063 2.0169
4219 3.0056 5.0076
4220 3.0056 5.0076
4222 3.0085
4223 3.0085
4224 3.0085
4225 1.0051 5.0018 6.0011 7.0067 8.0006
4226 3.0095 7.0060
4227 3.0095 7.0060
4228 1.0244
4229 1.0148 6.0004 8.0079
4230 3.0040
4232 3.0085 4.0018
4233 1.0128 1.0244 2.0037 8.0171
4235 1.0291 6.0003
4236 1.0005 1.0035 3.0005 7.0016
4237 1.0005 1.0035 3.0005 7.0016
4238 1.0033 3.0044
4239 3.0085
4241 3.0043
4244 1.0161
4267 3.0095
4278 2.0161
4284 3.0043
4287 8.0237
4298 3.0043
4309 3.0043
4314 3.0001 3.0002
4317 1.0172 2.0066 2.0158 8.0170
4318 3.0085
4324 1.0049 3.0099 3.0100 8.0188
4327 3.0086 3.0087 3.0088
4344 2.0161
4345 5.0042
4346 1.0128 8.0171
4359 1.0194 3.0092 5.0023 7.0012 8.0245
4360 1.0194 3.0093 5.0023 7.0012 8.0245
4361 1.0286 2.0156 8.0059
4362 1.0286 2.0156 8.0059
4363 3.0092 5.0023 8.0154
4364 1.0194 3.0091 5.0023 7.0012 8.0245
```

```
4365 1.0194 3.0092 7.0012
4366 8.0060
4367 1.0194 3.0092 7.0012
4368 1.0194 3.0091 5.0023 8.0245
4369 1.0194 3.0091 5.0023 8.0245
4370 1.0194 3.0091 5.0023 8.0245
4371 1.0194 3.0091 5.0023 7.0012 8.0245
4372 1.0286 2.0156 8.0059
4374 1.0228 8.0244
4375 1.0228
4376 3.0092 5.0023 8.0245
4377 8.0163
4378 1.0228 8.0244
4379 3.0091 5.0081
4384 1.0287 2.0115 8.0052
4385 1.0193 8.0258
4388 1.0194
4389 1.0228 8.0244
4395 1.0228 8.0244
4396 3.0093
4400 3.0091 3.0093 5.0081 8.0245
4401 3.0090
4402 3.0090
4403 3.0093
4404 1.0307 2.0114 3.0090
4405 1.0288 3.0091 5.0023 7.0012 8.0245
4406 3.0093
4407 1.0212 1.0287 1.0289 3.0092 5.0023 8.0154
4408 1.0194 3.0093 5.0023 7.0012 8.0245
4410 1.0194 3.0092 5.0023 7.0012 8.0245
4411 1.0212 3.0092
4412 1.0033 2.0115 7.0003 7.0004 8.0052
4413 3.0091 5.0081 8.0245
4414 3.0092
4416 8.0246
4417 3.0093 5.0023 8.0245
4418 3.0093 5.0081 8.0245
4419 8.0163
4420 1.0194 3.0093 5.0023 7.0012 8.0245
4421 8.0163
4422 3.0091 5.0081 7.0012
4424 3.0092 5.0081 8.0245
4425 8.0163
4426 1.0085 3.0014 3.0086 8.0031
4427 1.0160 3.0091 5.0081 7.0012 8.0243
4428 1.0286 2.0156 8.0059
4430 8.0163
4431 8.0163
4432 1.0007 1.0042 1.0085 2.0002 2.0101 3.0014 8.0113
4433 1.0194 3.0093 5.0023 7.0012 8.0245
4434 1.0194 3.0093 5.0023 7.0012 8.0245
4435 1.0194 3.0093 5.0023 7.0012 8.0245
4436 3.0092 5.0023 8.0154
4440 3.0086 4.0006 8.0031
4441 3.0086 4.0006 8.0031
4442 3.0092 7.0012
4443 1.0194 3.0092 5.0081 7.0012 8.0245
4444 1.0286 2.0156 8.0059
4445 3.0093
4448 3.0091
4449 3.0090
4450 1.0287 7.0013 7.0019 8.0052
4451 1.0212 3.0092 5.0023 8.0154
```

```
4453 8.0163
4454 8.0163
4455 3.0092
4456 3.0093
4457 1.0194 1.0289 3.0092 5.0081 7.0012 7.0019 8.0245
4458 1.0194 3.0093 7.0012
4459 1.0194 3.0093 5.0023 7.0012 8.0245
4462 8.0163
4463 1.0212 3.0092 5.0023 7.0013 8.0154
4464 1.0286 2.0156 8.0059
4465 1.0287 2.0115 8.0052
4466 3.0091
4467 8.0163
4468 1.0194 3.0093
4470 3.0091 5.0081 8.0243 8.0245
4471 1.0194 3.0091 5.0081 7.0012 8.0245
4472 1.0212 5.0023 7.0013 8.0154
4474 2.0114 3.0090
4475 1.0284 7.0093 8.0242
4476 2.0114 3.0090
4478 3.0093
4479 2.0114 3.0090
4482 1.0212 3.0092
4483 1.0286 2.0156 8.0059
4484 3.0092 3.0093 5.0081 7.0012 8.0245
4485 8.0246
4486 2.0114 3.0090
4487 1.0212 7.0013 7.0019 8.0154 8.0237
4488 1.0194 3.0091 7.0012
4489 3.0093
4494 3.0091 5.0023 8.0245
4495 8.0060
4496 8.0060
4497 8.0163
4498 8.0163
4499 1.0005 3.0091 3.0093 5.0081 8.0245
4504 3.0093
4505 8.0242
4507 1.0286 2.0156 8.0059
4509 1.0228 8.0244
4511 1.0286 2.0156 8.0059
4512 1.0194 3.0092 5.0023 8.0245
4513 1.0212 3.0092 5.0023 8.0154
4514 1.0194 3.0092 7.0012
4515 1.0286 2.0156 8.0059
4516 3.0092
4517 1.0212 1.0288 7.0013
4518 3.0092 3.0093 5.0023 8.0245
4519 1.0212 3.0093
4520 3.0092 5.0023 8.0245
4521 1.0287 7.0013 7.0019 8.0052
4522 1.0286 2.0156 8.0059
4524 1.0286 2.0156 8.0059
4527 3.0091 5.0023 8.0245
4531 3.0092 3.0093 5.0023 8.0245
4532 1.0212 5.0023 8.0154
4533 8.0246
4534 1.0212 5.0023 7.0013 8.0154
4535 2.0114 3.0090
4536 3.0093 3.0094 5.0081 8.0245
4539 1.0206 8.0246
4540 1.0194 3.0092 5.0023 8.0245
4541 1.0194 3.0093 5.0023 8.0245
```

```
4543 3.0092
4544 1.0212 3.0092
4545 1.0194 3.0091 5.0081 7.0012 8.0245
4548 1.0165 2.0043 3.0092 8.0247
4549 3.0091
4550 3.0092
4554 3.0093
4555 3.0091 7.0012
4556 3.0091
4558 1.0286 2.0156 8.0059
4559 3.0093
4560 8.0163
4561 1.0228 8.0244
4562 1.0228 8.0244
4563 3.0094
4566 1.0194 3.0093 3.0094 5.0023 7.0012 8.0245
4567 1.0071 3.0093 3.0094 5.0080 7.0094 8.0243
4568 3.0091
4569 3.0091
4570 1.0286 2.0156 8.0059
4572 1.0206 1.0212 8.0246
4573 1.0079 1.0289 3.0092 5.0023 7.0095 8.0154
4574 1.0194 3.0092 5.0023 7.0012 7.0095 8.0245
4575 1.0079 3.0093
4576 1.0307 3.0090 2.0114
4577 1.0033 2.0115 7.0003 7.0004 8.0052
4578 1.0165 3.0091 8.0163
4579 1.0173 2.0043 8.0163
4580 1.0173 2.0043 8.0163
4581 1.0173 2.0043 8.0163
4582 1.0194 3.0091 7.0012 8.0243
4583 3.0092 8.0245
4584 3.0092 7.0019 8.0245
4587 8.0060
4588 1.0085 3.0014 3.0086 8.0031
4589 1.0173 8.0163
4590 1.0212 3.0092 7.0012
4591 1.0160 1.0287 3.0093 7.0012 8.0245
4592 1.0160 1.0287 3.0093 7.0012 8.0245
4593 1.0071 3.0093 5.0080 7.0094 8.0243
4594 1.0228 8.0244
4595 1.0173 8.0163
4596 1.0173 8.0163
4598 1.0194 3.0093 7.0012
4599 1.0194 3.0093 7.0012
4600 1.0286 2.0156 8.0059
4601 1.0286 2.0156 8.0059
4602 8.0163
4603 8.0163
4604 3.0092
4607 1.0288 5.0080 7.0013 8.0245
4616 3.0092
4617 1.0212 1.0289 5.0080 7.0013 7.0019 8.0154
4618 1.0194 3.0091 7.0012
4619 8.0149
4620 3.0091 5.0081 7.0012
4621 3.0092 5.0023 8.0154
4622 3.0092 5.0023 8.0154
4623 8.0163
4624 2.0114 3.0090 8.0246
4626 1.0194 3.0093 7.0012
4627 1.0079 3.0093
4628 1.0194 3.0093 7.0012
```

```
4629 3.0093
4630 7.0019 8.0052
4636 1.0212 3.0091 5.0023 8.0154
4637 1.0194 3.0091 5.0081 7.0012 8.0245
4638 1.0212 3.0092
4641 1.0212 7.0013
4642 1.0212 7.0013 8.0052
4643 1.0194 3.0091 7.0012
4644 5.0023 8.0154
4645 3.0092 5.0023 8.0245
4646 3.0091 5.0023 8.0245
4647 3.0062 8.0163
4649 8.0163
4650 8.0163
4651 1.0194 3.0091 7.0012
4652 1.0173 2.0157 8.0163
4653 1.0307 3.0090
4655 1.0001 3.0001 3.0002
4656 1.0001 3.0001 3.0002
4657 1.0001 3.0001 3.0002
4658 3.0093
4659 1.0212 7.0013
4661 1.0024 8.0060
4662 3.0090
4663 1.0206 8.0246
4664 3.0092
4665 3.0092
4667 8.0161
4669 1.0212 3.0092 5.0023 8.0154
4670 1.0194 3.0092 5.0023 7.0012 8.0245
4671 1.0024 8.0060
4672 1.0288 5.0080 8.0237
4674 3.0062 8.0163
4675 3.0092
4676 3.0091
4677 1.0212
4678 8.0163
4679 1.0212 5.0023 7.0013 8.0154
4681 3.0092 5.0023 8.0154
4682 3.0091 5.0081 7.0012
4683 3.0092 5.0023 8.0245
4684 1.0018 2.0114 3.0090 8.0222
4685 2.0114 3.0090
4686 1.0011 2.0125 3.0086 3.0087 4.0006 8.0001 8.0032 8.0040
4687 1.0286 2.0156 8.0059
4688 1.0194 3.0092 7.0012
4689 1.0206
4691 1.0165 8.0163
4692 3.0091
4693 3.0091
4695 1.0286 2.0156 8.0059
4696 1.0286 2.0156 8.0059
4697 1.0194 3.0091 5.0023 7.0012 8.0245
4698 1.0194 3.0091 5.0023 7.0012 8.0245
4699 3.0090
4700 1.0212 3.0092 5.0023 8.0154
4701 3.0092
4702 3.0094
4703 1.0085 2.0101 3.0014 3.0086
4704 1.0085 3.0014 3.0086 8.0031
4705 1.0286 2.0156 8.0059
4706 1.0194 3.0091 7.0012
4707 1.0194 3.0091 7.0012
```

```
4709 1.0194 3.0091 5.0023 7.0012 8.0245
4710 8.0163
4711 3.0093 3.0094
4712 8.0163
4715 1.0286 2.0156 8.0059
4716 1.0173 2.0157 8.0163
4717 1.0212 1.0289 3.0092 5.0023 8.0245
4718 3.0090
4719 8.0163
4720 1.0228 8.0244
4721 7.0096
4722 1.0286 2.0156 8.0059
4723 8.0163
4724 1.0194 3.0091 7.0012
4725 1.0212 5.0023 8.0154
4726 1.0024 8.0060
4727 1.0194 3.0092 7.0012
4728 3.0090
4729 1.0212 1.0289 7.0019 8.0052
4730 1.0007 1.0010 1.0036 1.0083 2.0041 3.0010 8.0004
4731 1.0007 1.0010 1.0036 1.0083 2.0041 3.0010 8.0004
4732 8.0163
4733 8.0163
4736 8.0258
4737 1.0193 8.0258
4738 3.0091
4740 1.0033 7.0003 7.0004 8.0052
4742 1.0079 3.0092
4743 1.0079 8.0052
4744 1.0212 3.0093
4745 1.0024 8.0060
4747 1.0212
4748 3.0090
4749 3.0062 8.0163
4750 1.0079 3.0093
4751 3.0090
4752 1.0033 2.0115 7.0003 8.0052
4753 1.0194 3.0091 7.0012
4754 8.0163
4757 1.0206 8.0246
4759 3.0093
4760 1.0212 3.0092
4761 1.0212 7.0013
4762 8.0060
4763 1.0244
4766 3.0065 5.0008
4769 3.0095 7.0060
4770 1.0161 2.0050
4773 1.0160 2.0111
4774 3.0043
4776 1.0203 8.0142
4785 8.0136
4787 1.0055 3.0028 5.0008
4788 3.0065 5.0008
4789 1.0055 1.0278 3.0065 3.0106 5.0008 6.0029
4790 3.0065 8.0030
4791 1.0055 3.0036 5.0008 6.0011
4792 1.0309 2.0179 8.0180
4793 1.0161
4795 1.0244 3.0095 7.0060 8.0076
4796 1.0055 3.0101
4797 1.0244 3.0095 7.0060 8.0076
4780 1.0158
```

4781 3.0038 8.0052

APPENDIX 4

THE USE OF THE SIMPLE MATCHING COEFFICIENT IN K-MEANS CLUSTER ANALYSIS OF BINARY DATA

By Professor M Baxter

For two rows of a binary data matrix let a be the number of 1-1 matches, b the number of 1-0 matches, c the number of 0-1 matches, and d the number of 0-0 matches. With this notation the Jaccard coefficient has the form $a/(a + b + c)$, and the simple matching coefficient the form $(a + d)/(a + b + c + d)$, where $(a + b + c + d) = p$, the number of variables.

Both of these give rise to non-negative definite similarity matrices, with elements S_{ij}, which can be converted to Euclidean distance using,

$$d_{ij} = \sqrt{1 - S_{ij}}$$

from which,

$$S_{ij} = 1 - d_{ij}^2$$

where, if we use the latter transformation, d2ij has to be scaled to lie between 0 and 1 (eg Everitt *et al* 2001, 43).

Euclidean distance can be calculated as,

$$d_{ij}^2 = \sum_k (x_{ik} - x_{jk})^2$$

and applied to binary data the bracketed term will be equal to zero for a 1-1 or 0-0 match, and 1 otherwise so,

$$d_{ij}^2 = b + c$$

or, on scaling,

$$d_{ij}^2 / p = (b + c) / p = (b\_c) / (a + b + c + d)$$

which is 0 for identical rows and 1 if there are no matches. This gives rise to,

$$S_{ij} = 1 - d_{ij}^2 = (a + d) / (a + b + c + d)$$

which is the simple matching coefficient.

This suggests that clustering routines for binary data that use Euclidean distance as a measure of (dis)similarity are implicitly based on the simple matching coefficient rather than the Jaccard coefficient.